

EDITOR:
PROF. DR. ADEM BAYAR

MULTIDISCIPLINARY APPROACHES TO EDUCATION: PROBLEMS AND OPPORTUNITIES



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Having completed his primary and secondary education in Osmaniye, Dr. Bayar was accepted to Gazi University, Kastamonu Faculty of Education, Department of Classroom Teaching in 2000. Dr. Bayar, who continued his education in Kastamonu between 2000-2002, transferred to Cukurova University, Faculty of Education, Department of Classroom Teaching and graduated in 2004. Appointed as a classroom teacher the same year, Dr. Bayar completed his master's degree in Sakarya University, Institute of Social Sciences, Department of Educational Sciences, Department of Curriculum and Instruction in 2008. Dr. Bayar, who was sent to the USA with a scholarship from the Ministry of National Education, completed his doctorate in the Department of Educational Administration, Supervision, Planning and Economics at Missouri-Columbia University between 2009-2013 and returned to the country. He worked as an Assistant Professor at Amasya University, Faculty of Education, Department of Educational Sciences between 2013-2017; Dr. Bayar, who served as Associate Professor between 2017-2022 and as Professor between 2022-2025, continues his duty at Harran University Faculty of Education as of 2025.



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Editor

Prof. Dr. Adem BAYAR

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Preface

In today's understanding of education, the boundaries among disciplines are less clear than before, and finding common solutions to educational problems addressed from multiple perspectives has become even more effective. In this context, the relevant work was created by bringing together many different disciplines from Science to Music, from Physical Education to Social Sciences.

Written from the perspectives of different disciplines, this book offers comprehensive, qualified, and educational information to readers as a scientific and original work.

The sections that make up this book, which is thought to offer different perspectives and various contributions to interested people, have emerged as a result of the serious labor and effort of scientists who are experts in their fields. In this context, I would like to thank each of our authors individually.

Finally, I would like to express my gratitude to all publishing house employees who contributed to the publication of this book.

Prof. Dr. Adem BAYAR

Editor

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CHAPTER 1

UNIVERSITY STUDENTS' UNDERSTANDING AND PERCEPTIONS OF PET RECYCLING: A HANDS-ON EDUCATIONAL INTERVENTION

Ayşegül ASLAN¹

Vedat Arda KÜÇÜK²

Introduction

Plastic waste problem has emerged as a significant environmental challenge for almost all countries. Polyethylene Terephthalate (PET) bottles are among the most common plastic waste that persist in the environment for extended periods without degradation. Research by Geyer, Jambeck, and Law (2017) indicates that over 80% of all plastic manufactured since 1950 has been disposed of in landfills or the environment. This scenario results in significant pollution issues and adversely affects ecosystems. Plastic debris that accumulates in the oceans endangers marine life and facilitates the introduction of microplastics into the food chain (Andrady, 2011). Recycling is one of the most effective approaches to reduce plastic waste. Nonetheless, using traditional mechanical recycling procedures, waste thermoplastics can only be processed a few times since mechanical recycling leads to decline in material quality in each processing step. (Hopewell, Dvorak and Kosior, 2009). Consequently, the depolymerization of PET into its monomers

1 Assoc. Prof. Dr., Trabzon University, aysegulaslan@trabzon.edu.tr, 0000-0003-2363-0091

2 Res. Asst. Dr., Çankırı Karatekin University, ardakucuk@karatekin.edu.tr,
0000-0002-8620-9694

via chemical recycling emerges as a more sustainable option relative to conventional approaches (Al-Sabagh, Yehia, Eshaq, Rabie & ElMetwally, 2016).

Chemistry and engineering students are expected to take active roles in plastic production and recycling processes in the future, which makes their knowledge and awareness on this subject extremely important. However, studies have shown that students do not possess sufficient knowledge about recycling processes and their environmental impacts (Kollmuss & Agyeman, 2002). In this context, educational institutions play an important role in promoting sustainable practices, raising environmental awareness, and providing practical experience regarding industrial processes. This study aims to experimentally teach chemistry and chemical engineering students about PET recycling processes and to examine the changes in their knowledge levels. This research includes an educational intervention based on experimental application of the process of obtaining terephthalic acid by recycling PET through hydrolysis. In this context, it is anticipated that the results of the study will increase students' awareness of sustainable plastic management and provide them with practical knowledge of chemical recycling processes.

Unlike previous studies, this research aims not only to measure students' levels of knowledge and awareness but also to teach them the process of recycling PET through hydrolysis and obtaining terephthalic acid in a hands-on manner. In this way, it is aimed for students to reinforce their theoretical knowledge with practical experience and to gain an in-depth understanding of chemical recycling processes. Students experiencing the depolymerization process of PET within the reactor firsthand will enable them to better understand chemical processes and evaluate the effectiveness of the catalysts used in the process. Kollmuss and Agyeman (2002) argue that gaining environmental awareness is not sufficient for it to translate into environmental action. Therefore, this study aims not only to increase students' knowledge about plastic waste but also to support this knowledge with hands-on experience, thereby fostering a long-term sense of environmental responsibility. While education on plastic recycling at universities generally focuses on theoretical aspects and mostly mechanical recycling processes, this study fills an important gap by enabling the learning and experiencing of chemical recycling of plastic waste. Additionally, by encouraging chemistry and chemical engineering students to work together, an interdisciplinary learning environment has been created in the study. In this respect, the research differentiates itself from similar studies in the literature and aims to provide students with both theoretical and practical skills.

Method

Methodology of Research

In this study, the case study method, one of the qualitative research methods, has been preferred. This method allows for a detailed examination of individuals, groups, institutions, events, or processes, enabling the understanding of the researched topic's cause-and-effect relationships (Yin, 2018). The quantitative part of the study was conducted with a single-group pre-test-post-test experimental design. Students' perceptions of the process and how the educational intervention contributed to their learning were supported by direct quotations.

Study Group

A research team comprised 24 students from a state university in Turkey, including 18 from the Chemistry Department and 6 from the Chemical Engineering Department in the 2024-2025 academic year. Purposive sampling was employed to select these students to ensure that the participants possessed a fundamental understanding of chemistry, essential for comprehending the technical aspects of PET recycling.

Instrument for Data Collection

Pre-test and post-test questions served as a data collection instrument to assess students' comprehension and perspectives on PET and recycling processes. In the pre-test, *What is PET and what products are typically manufactured from it?, What is the general procedure of the recycling process, and how are PET bottles treated within this framework?, What is your interpretation of the term depolymerization? Elucidate the associated process., What is your knowledge regarding the environmental consequences of PET bottles?, What are the potential applications of recycled plastics?, What is the significance of recycling PET bottles?''*. The objective of these inquiries is to ascertain the students' pre-intervention perspectives. In the final assessment, the inquiries encompassed: *Elucidate the chemical structure of PET and its degradation process during depolymerization. Enumerate the stages of the depolymerization process and the primary chemicals utilized therein. "What products can be manufactured from recycled PET, and what are the potential benefits of these products? What environmental risks may occur during the depolymerization of PET bottles? What are the advantages and disadvantages of the depolymerization process in recycling? What could be the overall economic impacts of the PET bottle recycling process?"*

This approach has enabled the assessment of how the experimental process has altered students' understanding and perceptions of PET and recycling methods.

Data Analysis

In this study, the content analysis method was used to examine the change in students' knowledge and perceptions regarding PET recycling. The data collection process was conducted through open-ended questions in two stages: pre-test and post-test. In the presentation of direct quotations, students from the chemistry department are coded as "C" and students from the chemical engineering department as "CE."

Intervention

The educational intervention introduced students to the recycling process of waste PET through hydrolysis ~~and~~ which is yielding terephthalic acid. In the first phase, a pre-test was conducted to examine students' basic understanding of waste PET and PET recycling methods. For three weeks, students participated in hands-on sessions in which they experienced chemical recycling of waste PET with hydrolysis approach. The steps of the procedure is as follows: waste PET bottles were collected and shredded. The shredded PET particles were placed in a stainless-steel autoclave reactor alongside the catalyst (zinc acetate dihydrate) and water.

After sealing of the reactor heating and mixing were started at a steady pace to react precursors at very high temperatures (over 250°C) and high pressures (40 bar). At the high temperatures water and the catalyst break down the polymer chain of PET (depolymerisation) into its monomer terephthalic acid. The resulting products were white solid crystals in water. These white products were separated from the mixture and the chemical structure of the solid was analyzed using FTIR spectroscopy. Following the real-world application of depolymerizing PET into terephthalic acid, a post-test was conducted to assess changes in students' comprehension and remembering on the topic.

Ethics Committee Approval Documents

This research will include voluntary participation, and participants' data will be safeguarded in compliance with confidentiality norms. Participants received comprehensive information on the study's goal, methodology, and procedures beforehand, and their involvement in the research was completely voluntary. Throughout the study process, all safety measures were used

throughout the experimental investigations involving hazardous substances, safeguarding the health and safety of students in the laboratory setting. The pre-test and post-test questions employed to assess the participants' knowledge and perceptions of PET recycling were examined anonymously, without any association to the students' identities. Throughout the study, complete adherence to ethical regulations was upheld, and to avert any ethical infractions, actions were conducted under the auspices of the ethical committee approval numbered E-81614018-050.04-2500011952 from the Trabzon University Social and Human Sciences Scientific Research and Publication Ethics Committee.

Findings

This section presents the findings of this study based on the pre-test and post-test results, which were done to evaluate the participants' comprehension of PET recycling and depolymerization. The students' answers were classified into three categories: right and complete answers, partially correct answers, and incomplete or wrong answers. Each category contains exemplary examples from student responses to demonstrate the spectrum of comprehension observed prior to and during the educational intervention.

The pre-test findings underscore the students' preliminary knowledge deficiencies, especially on the chemical nature of PET, depolymerization methods, and the environmental and economic ramifications of PET recycling. The post-test results indicate a substantial increase in students' understanding, highlighting the effect of experiential learning opportunities. Through active involvement in PET recycling via hydrolysis, students acquired actual knowledge of industrially pertinent chemical processes, so enhancing their theoretical comprehension. The next sections delineate the findings for each test question, including particular examples from student replies across many categories to provide a thorough overview of their conceptual advancement throughout the research.

Pre-Test Findings

Question 1: What is PET, and what products are commonly produced from it?

Precise and Thorough Answers: CE1: *“PET is a thermoplastic polymer produced from terephthalic acid and ethylene glycol monomers. It is employed in maritime vessels and textiles.”*

Responses Exhibiting Partial Accuracy: C5: *"PET signifies polyethylene terephthalate. Employed in PET containers."*

Inadequate or Incorrect Responses: C12: *"Polytetrafluoroethylene."*
Involved in the textile and medical device sectors.

Question 2: What is the overarching strategy for recycling, and what is the specific processing method for PET bottles?

Recycling involves the collection, classification, purification, shredding, melting, and processing of materials.

Responses Exhibiting Partial Accuracy: C7: *"PET bottles are collected, shredded, and melted for further processing."*

Imprecise or Insufficient Responses: C5: *"The reclaimed plastics return to their original state after designated procedures."*

Question 3: What characterizes depolymerization?

Depolymerization denotes the process of disassembling polymer chains into monomers or smaller molecular entities.

Reactions Demonstrating Incomplete Precision: C3: *"It represents the opposite of polymerization."*

Inadequate or Incorrect Responses: C7: *"Recycling of Polyethylene Terephthalate."*

Question 4: What is your understanding of the environmental impacts of PET bottles?

Precise and Thorough Answers: CE6: *"Pollution resulting from plastics, carbon emissions, and chemical pollutants."*

Inaccurate Responses: C10: *"They negatively impact the environment and wildlife because of their extended decomposition duration."*

Insufficient or Erroneous Responses: C8: *"They occupy an excessive amount of space as waste."*

Question 5: What are the applications of recycled plastics?

Precise and Thorough Answers: CE6: *"Textiles, packaging, automotive parts, construction materials."*

Responses with Restricted Precision: C14: *"Engaged in the manufacturing of packaging."*

No inaccuracies recorded.

Question 6: What is the importance of recycling PET bottles?

Precise and Thorough Answers: CE6: *"Recycling PET bottles reduces environmental pollution, preserves resources, and saves energy."*

Incorrect Responses: C17: *"To prevent environmental pollution."*

No inaccurate responses recorded.

Post-Test Findings

Question 1: Explain the chemical structure of PET and how it breaks down during depolymerization.

Precise and Thorough Answers: CE1: *"PET is a polymer of terephthalic acid and ethylene glycol. Chemical formula: [-O-CH₂-CH₂-O-CO-C₆H₄-CO-]."*

CE4: *"During depolymerization, ester bonds in PET are broken by hydrolysis, pyrolysis, or catalysis."*

Responses Exhibiting Partial Accuracy: C2: *"It changes from polymer to monomer by heating with water."*

C7: *"First melted, pulverized, washed, and cleaned."*

Inadequate or Incorrect Responses: C3: *"Melted, then pulverized."*

C14: *"Polyester."*

Question 2: List the steps of the depolymerization process and the main chemicals used.

Precise and Thorough Answers: CE3: *"Steps: Glycolysis and hydrolysis. Chemicals: Methanol."*

CE6: *"Steps: Collection, cleaning, chemical treatment, purification, repolymerization. Chemicals: Methanol, ethylene glycol, NaOH."*

Responses Exhibiting Partial Accuracy: C4: *"PET and water are placed in the reactor and heated under high pressure."*

C10: *"PET, H₂O, NaOH, ethylene glucose, terephthalic acid."*

Inadequate or Incorrect Responses: C8: *"PET is crushed and placed in the device with water."*

C13: *"Battery boxes, chemical devices, sulfur."*

Question 3: What products can be produced from recycled PET and what are their advantages?

Precise and Thorough Answers: CE1: *"Water bottles, textiles. Advantages: Waste reduction, eco-friendliness."*

CE6: *"Textiles, packaging, automotive parts, new PET bottles. Advantages: Energy saving, waste reduction."*

Responses Exhibiting Partial Accuracy: C4: *"Bottles, car parts, textiles."*

Advantages: Less raw material use."

C15: *"Water bottles, clothes, containers. Reduces pollution."*

Inadequate or Incorrect Responses: C6: *"Plastic bottles, various plastic products."*

CE4: *"Produces PET, produces monomers."*

Question 4: What are the environmental risks of PET depolymerization?

Precise and Thorough Answers: CE4: *"Toxic gas emissions, increased energy consumption."*

CE6: *"Chemical leaks, toxic by-products, high energy use."*

Responses Exhibiting Partial Accuracy: C2: *"Chemical by-products may form."*

C14: *"Toxic gases may be released, harming the environment."*

Inadequate or Incorrect Responses: C5: *"May cause environmental pollution."*

C9: *"None."*

Question 5: What are the advantages and disadvantages of depolymerization in recycling?

Precise and Thorough Answers: CE3: *"Advantages: High-quality monomer recovery, eco-friendly. Disadvantages: High energy cost, by-products."*

CE6: *"Advantages: Circular economy contribution, waste reduction. Disadvantages: Environmental risk if chemicals are mismanaged."*

Responses Exhibiting Partial Accuracy: C4: *"Advantage: Reduces raw material use. Disadvantage: Not as strong as original material."*

C15: *"Advantage: Economic benefit. Disadvantage: May harm the environment."*

Inadequate or Incorrect Responses: C8: *"No disadvantages."*

C12: *"Excess volume products are reused, preventing pollution."*

Question 6: What are the economic effects of PET recycling?

Precise and Thorough Answers: CE5: *"Economic growth, local production support, job creation."*

CE6: *"Raw material savings, energy reduction, lower imports."*

Responses Exhibiting Partial Accuracy: C4: *"Cheaper than raw materials, so production costs decrease."*

C10: *"Recycling reduces environmental damage and raw material use."*

No inaccurate responses recorded.

Discussion

This study was carried out to measure the knowledge level of chemistry and chemical engineering students on PET recycling and depolymerization and to investigate whether an applied educational intervention can improve this knowledge level. The pre-test and post-test results highlighted the initial conceptual deficiencies of the students and the significant gains in knowledge and skills at the end of the training process. The results show that experiential learning methods are effective in increasing the awareness of chemistry and engineering students on sustainable plastics waste recycling approaches.

The pre-test findings revealed that students had limited knowledge about the chemical structure, recycling processes and environmental impacts of PET. Especially the concept of depolymerisation was defined incorrectly or incompletely by the students. For example, some students defined the process only as ‘melting of plastics’ focusing on the mechanical recycling and did not include details of chemical recycling methods such as breaking chemical bonds and conversion to monomer level. Similarly, most of the students who defined the stages of PET recycling mentioned only mechanical recycling (collection, separation, melting) and did not give detailed information about chemical recycling. These findings are consistent with the relationship between environmental awareness and behaviour proposed by Kollmuss and Agyeman (2002). In their study, they emphasized that having only theoretical knowledge about environmental issues is not sufficient to create behavioural change. Therefore, it is necessary for students not only to learn PET recycling processes, but also to perform these processes themselves through a practical experience.

The three-week experimental training programme conducted within the scope of the study significantly increased the students’ knowledge about PET recycling. The post-test findings show that there was a significant improvement in the students’ awareness of the chemical structure, depolymerisation process and environmental impacts of PET. In particular, the answers to the questions such as defining the chemical structure of PET and explaining the depolymerisation stages in detail reveal that the students have a better understanding of the processes. For example, some students correctly stated in the post-test that the process can occur through different chemical pathways such as hydrolysis, glycolysis and methanolysis. This development shows that students’ direct experience in the reactor reinforced their theoretical knowledge. These results are in parallel with a study conducted by Denis and Zepeda (2020). Denis and Zepeda found that experimental laboratory practices for chemical engineering students

strengthened their understanding of process engineering and environmental sustainability. Similarly, the current study shows that experiential learning methods are effective in increasing academic achievement.

The post-test results show that the students had a better understanding of not only the PET recycling process but also the advantages and disadvantages of depolymerisation. For example, students were able to make a more analytical evaluation by stating that chemical recycling of PET offers raw material recovery and an environmentally friendly solution, but the process has disadvantages such as high energy consumption and cost. This situation shows that students think more consciously about sustainability issues. Hopewell, Dvorak, and Kosior (2009) stated that plastic recycling offers limited environmental benefits and that the uses of recycled PET have certain limitations. Developing such critical perspectives in students may lead them to make more informed decisions in future scientific and engineering applications.

Conclusion and Recommendations

This study highlights the significance of experiential learning in shaping students' attitudes and understanding of PET recycling. Significant results encompass the following:

- The post-test responses indicate a notable enhancement in students' understanding of environmental impacts, recycling processes, and the chemical composition of PET.
- The hands-on recycling sessions successfully linked theoretical knowledge with practical applications, providing students with essential skills to tackle industrial and environmental challenges.
- The intervention highlighted the economic and environmental advantages of recycling to enhance awareness of the significance of sustainable practices in plastic waste management.

Based on the results obtained within the scope of the study, the following ~~suggestions can be made~~ recommendations are proposed for future research:

- Universities should integrate supplementary practical modules centered on waste management and sustainable practices to furnish students with the requisite skills and knowledge to tackle real-world challenges.

- This study was conducted with a limited group of students (n=24). Further studies with a larger sample may reveal the effect of educational programmes on PET recycling in a stronger way.
- Collaboration among academic institutions, enterprises, and policy-makers is crucial to facilitate the widespread implementation of advanced recycling technologies, including depolymerization.
- Future research should investigate the long-term effects of these interventions on students' career choices and their contributions to sustainable practices and innovations
- Integrating students from various disciplines into the program may foster interdisciplinary approaches to tackle sustainability challenges.

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CHAPTER 2

EFFECTS OF PLYOMETRIC TRAINING ON BALANCE AND JUMPING IN 15-18 YEARS OLD FEMALE VOLLEYBALL PLAYERS

Ergün AKÇA¹

1.What is Plyometric Training

Plyometric training is a type of training that helps to develop speed, power, muscular strength and muscular endurance simultaneously. Plyometric training is one of the effective methods for athletes to develop explosive strength and improve their performance. These workouts aim to strengthen the elastic properties of the muscle-tendon system and optimize the combination of speed and force. This training method, which includes high-intensity exercises and sudden, explosive movements, has found a wide place in the sports literature as an effective tool to improve the performance of athletes. It is emphasized that plyometric training has the potential to improve the performance of athletes in sports that require speed, agility, jump height and balance such as volleyball (Schmidtbleicher, 1992; Arazi, Coetzee, & Asadi, 2012). Volleyball is a widely preferred sport especially among young athletes, and the development of basic motor skills is very important in this age group. Since elements such as balance, sudden changes in direction, and jumping height are at the core of volleyball, the development of these skills in young athletes is directly related to the effectiveness of training programs. Balance

¹ Nişantaşı University, Turkey, ergun.akca@gmail.com
<https://orcid.org/0009-0003-7321-3971>

refers to the ability of athletes to keep their body center of gravity under control. A balanced body posture in volleyball is necessary for players of all ages to perform at the highest level. In volleyball, where sudden movements, rapid changes of direction and movements such as jumping are frequently repeated, balance is a factor that directly affects performance as well as reducing the risk of injury (Komi, 2003; Lees, 2003). In addition, plyometric training improves the body's balance mechanisms and increases the ability of athletes to maintain their balance on the court. Studies have supported that plyometric training contributes to the improvement of balance in young female athletes. For example, Myer et al. (2005) reported that plyometric training programs supported balance development in young athletes and also improved their coordination abilities. Jumping height is a critical skill for volleyball performance; especially in movements such as blocking and spiking, jumping capacity is decisive. Plyometric training aims to increase jumping capacity by strengthening the elastic properties of the muscles and increasing their ability to contract rapidly. There is a wide acceptance in the literature that plyometric training, which contributes to athletes to gain the ability to jump higher in a shorter time, provides a significant improvement in jump performance (Chu, 1998; Markovic, 2007). Research shows that, especially in young athletes, since the potential for development in muscle structure is high, a rapid and effective increase in jump performance can be achieved if the correct training programs are applied. For example, in a study conducted by Arazi et al. (2012), it was revealed that a significant increase in jump height was achieved in young volleyball players who underwent plyometric training.

Plyometric training is a type of training that aims to produce explosive force by making the muscles rapidly tense and then contract. This method is used to improve the performance of athletes, especially in sports where explosive power is critical, such as volleyball. Plyometric movements are based on the muscles storing elastic energy and releasing it with maximum force. Kanbak (2021) emphasizes that plyometric training increases the flexibility and endurance capacity of the muscle-tendon system. This type of training aims to improve both physical endurance and movement speed of athletes (Harput et al., 2017:236). Research shows that plyometric training can be adapted to different sports branches. Especially in sports such as volleyball, basketball and soccer, it enables players to be more effective in movements that require speed, jump height and explosive strength. Karakuş (2024) states that plyometric training improves athletes' sudden change of direction ability and balance control. These features allow athletes to move faster and more decisively on the field. During plyometric exercises,

muscles adapt to high-intensity loading, which can reduce the risk of injury in the long term (Eroğlu, 2024:35). Plyometric training improves the ability to coordinate between the muscles and the nervous system. Strengthening proprioceptive perception makes it possible for athletes to control muscle movements more efficiently. Hincal (2024) states that plyometric training increases motor control skills and improves the reflex speed of athletes. This development has positive effects not only on physical performance but also on mental processes. Athletes also increase their self-confidence on the field thanks to the increase in physical capacity they achieve through plyometric training (Gür, 2024:70). Plyometric training can be used not only to improve physical performance but also as an effective tool in the rehabilitation process of athletes. Especially after injury, this type of training is frequently used to regain muscle and tendon endurance. Arazi and Asadi (2011) state that plyometric training accelerates the rehabilitation process of athletes and reduces the risk of re-injury. This shows that plyometric training is a versatile training method for both professional and amateur athletes.

2. Balance in Volleyball

Volleyball is a sport that requires intense physical mobility, sudden changes of direction and high jumps. These characteristics cause balance skills to play a decisive role in the performance of athletes. Volleyball players need to be able to use both static and dynamic balance effectively in order to be successful on the court. Harput et al. (2017) state that controlling balance is a fundamental skill in sports such as volleyball and this skill increases performance by combining with technical skills. For example, a player's ability to maintain balance while blocking or dunking directly affects offensive and defensive skills (Silva et al., 2019:2964). Balance in volleyball is recognized as a combination of mobility and body awareness. During the match, athletes' ability to control the balance center increases the accuracy and speed of movements. Hernandez-Martinez et al. (2023) stated that the correct use of balance improves the athletes' time to reach the ball and reaction speed. The development of balance skills allows athletes to adapt faster to game strategies and to be prepared for sudden changes in the situation. At the same time, balance mechanisms reduce the risk of injury during the game (Arazi and Asadi, 2011:107).

Volleyball, where dynamic movements are at the forefront, greatly benefits from training programs that include balance exercises that strengthen the proprioceptive perception of athletes. Equipment such as balance boards and stability balls help athletes improve their motor control skills and muscle

stability (Silva et al., 2019:2963). Plyometric training makes it easier for athletes to adapt to movements that require sudden jumps and changes in direction. Regular application of plyometric training enables volleyball players to maintain their balance more effectively during movement. Mutlu (2023) stated that balance training not only improves physical performance but also supports players' self-confidence in the match. For volleyball players, balance skills increase not only individual performance but also the ability to adapt to team strategies. For example, the ability of spikers to be in the correct position during offense or defenders to maintain body balance while blocking directly affects the overall success of the team (Ceylan et al., 2022:63). Players in positions such as libero need to have a high level of balance control in order to perform low-altitude movements effectively. For this reason, balance training is seen as an indispensable part of team training.

For volleyball players, balance skills have a critical importance in preventing injuries as well as performance. Especially in this sport where ankle and knee injuries are common, balance training is considered as a measure to minimize injury risks (Hernandez-Martinez et al., 2023:7). In addition to reducing the risk of injury, balance training enables athletes to increase their physical endurance during the game, enabling them to perform at a high level for a long time. This supports athletes' performance continuity, especially in long-term tournaments.

2.1. Static Balance

Static balance is defined as the ability of individuals to keep their body weight balanced on a support point in a stationary position. This skill requires the correct functioning of the musculoskeletal system, balanced distribution of body weight and maintenance of the center of gravity. Harput et al. (2017) associated static balance with motor control skills and emphasized that postural stability is an essential element of this process. Static balance is directly linked not only to physical competence but also to the efficiency of neurological mechanisms such as the vestibular system and proprioceptive perception (Ceylan et al., 2022:63).

For athletes, static balance is of great importance as a performance-enhancing element. Especially in sports that require intense physical movements such as volleyball, it facilitates taking the correct position before movement and maintaining stability. Silva et al. (2019) stated that static balance directly affects the athlete's movement efficiency. Physical characteristics such as muscle strength and flexibility play a major role in maintaining balance. The strength of the lower extremity muscles contributes

to balance control by keeping the body in balance and increasing the range of motion of the muscles (Mutlu, 2023: 1745).

2.2.Dynamic Balance

Dynamic balance refers to the ability of individuals to maintain body stability while moving. Maintaining balance during movement requires both adapting to environmental conditions and keeping body coordination at a high level. Ceylan et al. (2022) emphasized that dynamic balance has a critical importance in daily life activities and sports performance. Especially in mobile sports, it has a decisive effect on skills such as changing direction or accelerating without losing balance (Silva et al., 2019:2964). Exercise methods used to improve dynamic balance include coordination exercises, balance board exercises and plyometric training. These exercises enable athletes to adapt better to sudden movements by increasing their reflex speed. Harput et al. (2017) stated that dynamic balance training is an effective method for improving motor skills, especially in athletes. Regular implementation of the exercises can increase the performance continuity of athletes by reducing the risk of injury (Silva et al., 2019:2963).

3. Jumps in Volleyball

Under this title, the types of jumping movements and their effects on sports performance will be discussed in detail. Firstly, different types of jumping such as vertical jump, horizontal jump and depth jump will be defined. Then, the importance of jumping movements in volleyball, the advantages they provide during the game and the methods used by athletes to improve this skill will be emphasized.

3.1. Vertical Jumps

Vertical jumping refers to the capacity of an athlete to reach maximum height by moving upward perpendicular to the ground. In sports that require jumping, such as volleyball, this skill is an important element that directly affects the performance of the players. Harput et al. (2017) stated that vertical jumping plays a critical role in both offensive and defensive movements of volleyball players. Especially movements such as dunking and blocking become more effective with a high vertical jump capacity. Therefore, it is necessary to include jump development activities in the training programs of athletes.

Vertical jumping ability is closely related to physical characteristics such as muscle strength and explosive power. Research shows that especially lower body muscles are one of the main factors determining jump height (Silva et al., 2019:2962). In addition to the leg muscles, it is also stated that the core muscles increase the efficiency of the movement. This allows athletes to optimize energy transfer during jumping. In addition, improving proprioceptive perception increases the ability to maintain balance during jumping, allowing the movement to be performed more effectively (Ceylan et al., 2022:63). Plyometric exercises are prominent among the training methods applied to increase vertical jump capacity. Plyometric exercises aim to increase jump performance by improving the elastic properties and explosive strength of the muscles. Hernandez-Martinez et al. (2023) stated that plyometric training not only increases the jump height of athletes but also improves their movement speed. It is stated that the regular application of plyometric training reduces the risk of injury by strengthening the muscle-tendon complex of athletes (Mutlu, 2023:1745).

Vertical jumping also allows athletes to gain strategic advantage during the game. Especially in sports that require high jumps, such as volleyball, the ability of players to get higher than the opponent increases offensive and defensive efficiency (Hernandez-Martinez et al., 2023:6). For example, the ability of a spiker to hit the ball over the opponent's blocks or a blocker to block the opponent's offense is possible with the adequacy of jumping capacity. Therefore, jump development is considered as an essential part of volleyball players' training programs.

3.2. Horizontal Jumps

Horizontal jumping refers to the capacity of an athlete to advance in the horizontal plane by taking power from the ground during movement. Horizontal jumping is an important physical skill, especially in sports that require speed, power and explosive strength. In sports such as volleyball, horizontal jumps are critical in situations such as changing position during a dunk or making a quick defensive move (Açıkada et al., 2022:54). Horizontal jump performance is directly related to physical elements such as muscle strength, speed and coordination. The development of these elements enables athletes to be more effective on the field.

Research shows that training methods applied to improve the horizontal jump are effective in increasing the performance of athletes. Plyometric training optimizes the power produced during jumping by increasing muscle elasticity. These trainings, which especially improve the ability

of fast contraction, are frequently used to maximize horizontal jumping ability (Sitti & Koroğlu, 2023:3). Training with tools such as the balance board and stability ball allows athletes to improve their proprioceptive skills and maintain balance during movement. This increases the reaction speed of athletes on the field and makes them more effective during the game (Hernandez-Martinez et al., 2023:7). In addition to the leg muscles, the strength of the muscles in the hip and core region also plays a major role during horizontal jumping. It is known that the hip muscles create the initial power of the movement, while the core keeps the body in balance (Alikhani et al., 2019:145). Therefore, athletes should include exercises that target not only the leg muscles but also the hip and core muscles in their strength training. Studies show that such comprehensive training programs increase the horizontal jump performance of athletes and strengthen their overall physical endurance (Majeed et al., 2016:105). Horizontal jumping is not only a physical movement, but also related to strategic decisions in the game. In volleyball, a player's ability to leap at the right moment to reach the ball or quickly cross the defense line reveals the importance of horizontal jumping skill (Arazi & Asadi, 2011:103). Such movements make it possible for players to adapt to game strategies faster and contribute to team success. The development of horizontal jumping offers an important strategic advantage that increases players' effectiveness in the game.

3.3.Depth Jumps

Depth jumps are a type of training that requires athletes to jump up with maximum explosive force after landing from a certain height. This method aims to develop fast contraction and energy conversion mechanisms while strengthening the lower body muscles (Karasu, 2024:62). In sports that require jumping and speed, such as volleyball, depth jumps increase the on-court movement efficiency of players. These exercises, performed with platforms of varying heights, enable athletes to gain higher jumping capacities by strengthening their muscle-tendon complexes (Şener, 2024:67). This is especially advantageous in offensive and defensive positions where it is critical to be superior to the opponent.

The main purpose of depth jumps is to increase the ability of the muscles to produce rapid force. This skill forms the basis of plyometric movements and increases the explosive power capacity of athletes. Hıncal (2024) stated that this type of training improves jump height and speed by increasing the lower body muscle strength of athletes. Studies show that depth jumps strengthen the elastic properties of muscles and tendon endurance (Gür, 2024:58). These features enable athletes not only to increase jump height

but also to reduce the risk of injury that may occur during landing. Depth jumps promote not only physical but also neurological adaptations. The coordination between the muscles, tendons and nervous system during landing and jumping increases the athletes' fast reaction times and overall movement efficiency. Eroğlu (2024) emphasized that depth jumps strengthen the proprioceptive perception of athletes and improve balance control. Strengthening proprioceptive perception allows athletes to adapt faster to sudden movement changes (Akbulut, 2024:72). This makes it possible to perform more efficiently, especially in sports with frequent dynamic movements such as volleyball.

The benefits of depth jumping are not limited to strength gains. This type of training also increases the endurance levels of athletes. Research shows that depth jumps increase the overall physical capacity of athletes by activating aerobic and anaerobic energy systems simultaneously (Kanbak, 2021:58).

4. The Importance of Jumping in Volleyball

Volleyball is a sport that requires high physical skills and athletic performance. In this context, jumping ability is a determining factor on the success of volleyball players on the court. The jumping movement plays a critical role in the offensive and defensive plays of volleyball. The effective execution of movements such as dunking, blocking and fast position changes is directly related to the athletes' jumping height, explosive strength and body control (Karasu, 2024:63). The superiority of volleyball players on the court is directly proportional to how efficiently they can apply jumping movements. Players with high jumping capacity can gain a strategic advantage over their opponents. In addition, jump training is considered as an important tool to increase the overall physical endurance of volleyball players (Eroğlu, 2024:38).

Jumping in volleyball enables players to hit the ball more effectively during offense. The ability of the players to contact the ball on the opponent's blocks during the dunk directly affects the success rate of the offense. Research shows that spikers with high jumping capacity can apply more offensive variations (Hukanoğlu, 2024:52).

Besides that, jumping skills are also of great importance when blocking. Blockers need height and timing to neutralize the opponent's attacks. Gür (2024) states that jumping during blocking involves not only height but also the ability to take the correct position. In volleyball, jumping movements increase the overall performance of the team by establishing a balance

between offensive and defensive plays. Jumping also plays a critical role in defensive play. Players in defensive positions, such as the libero, need the ability to jump in order to quickly change positions and adapt to sudden movements. This should be supported by training that improves players' reflexes and movement speed (Yalvaç, 2024:66). The jumps made during defense constitute not only the ability to reach the ball, but also a part of the team's overall defensive strategy. Karakuş (2024) states that leaping ability in defensive play increases the team's game effectiveness by optimizing the placement and positioning of players. The leaping ability is seen as an element that strengthens the defense line and can disrupt the opponent's game plan.

5. Types of Plyometric Training

Plyometric training, which is used to increase the explosive power and athletic performance of athletes, is divided into various categories according to their application methods. In this context, the characteristics of plyometric training types such as in-place jumps, standing jumps, multiple jumps and skips, hops, muscle jumps and depth jumps will be explained. Each type is applied to address different physical needs and performance goals of athletes. Each of these exercises aims to improve athletes' skills such as flexibility, balance, speed and strength by targeting different muscle groups. In this context, under each sub-heading, a detailed description of the relevant training type and its benefits will be discussed.

5.1. In-place Jumps

In-place jumps are one of the most widely used exercises that form the basis of plyometric training types. It involves athletes making vertical or slightly horizontal jumps at a specific point, without moving forward or sideways. This type of exercise increases the elasticity of the muscles. In addition to strengthening the eccentric and concentric properties of the muscles, jumps in place increase the jump height and movement control of athletes (Hernandez-Martinez et al., 2023:5). It is an effective method to increase the performance of players, especially in jump-intensive sports such as volleyball. Harput et al. (2017) states that in-situ jumps have positive effects on muscular endurance and energy efficiency. This type of training is used to strengthen the leg muscles of athletes and increase lower body explosive strength. It especially allows effective training of quadriceps, hamstring and calf muscles. Eroğlu (2024) states that jumping in place isolates muscle groups and provides an effective development in the targeted

areas. In addition, it was observed that balance and coordination skills were also improved during jumping in place. It is stated in the studies in the literature that athletes provide body control during jumping and increase the efficiency of the muscle-tendon system (Silva et al., 2019: 2962).

5.2. Standing Jumps

Standing jumps, as a basic type of plyometric training, is a type of exercise that allows athletes to produce explosive force by jumping from a certain starting position. This type of training aims to increase the capacity of the muscles to produce explosive power by jumping without any starting movement. In particular, this exercise, in which there is no starting speed, aims to optimize the maximum force production of the muscles (Hernandez-Martinez et al., 2023:8). This method contributes to an effective performance of athletes during movements that require sudden power. Eroğlu (2024) states that standing jumps help athletes to develop a more dynamic style of play by increasing muscular endurance. During standing jumps, the rapid realization of eccentric and concentric contractions improves the capacity of muscles to store elastic energy and convert this energy into kinetic energy. Arazi and Asadi (2011) stated that standing jumps significantly improve the performance of athletes by increasing the elastic properties of the muscle-tendon system. Regular practice of the exercises increases the mobility and reflex speed of athletes during the game (Silva et al., 2019:2963).

5.3. Multiple Leaps and Jumps

Multiple jumps and skips are one of the types of plyometric training in which athletes perform consecutive jumps and skips without interruption. These exercises increase the explosive force production capacity and improve the flexibility and endurance properties of the muscle-tendon system. Şener (2024) states that this type of training optimises the performance of athletes in jump-intensive sports such as volleyball, basketball and athletics. Especially consecutive jumping movements increase the physical endurance of athletes, allowing them to be more effective in competitions (Hernandez-Martinez et al., 2023:9).

These exercises, which can work different muscle groups at the same time, strengthen the balance and coordination skills of athletes as well as increasing lower body strength. These movements, in which especially quadriceps, hamstring and calf muscles work actively, maximise muscular endurance and movement control. Karasu (2024) states that multiple jumps help athletes to maintain balance control in sudden movement changes.

The continuity of the movements enables the muscle-tendon system to use the energy conversion mechanisms effectively (Eroğlu, 2024:39). These exercises, which improve energy conversion processes, allow athletes to perform higher performance with less energy.

5.4. Bounces

Bounces are considered one of the most effective types of plyometric training and consist of consecutive rhythmic jumping movements to increase the explosive power of athletes. This type of exercise offers a training method to improve speed, coordination and balance skills of athletes. Especially in sports that require explosive power such as volleyball, basketball and track and field, jumps have a critical role in optimising athletes' performance. Hernandez-Martinez et al. (2023) stated that hops have a strong effect on the neuromuscular system and increase the motor control skills of athletes. Regular practice of these exercises helps athletes to adapt to rapid movement changes more easily (Arazi and Asadi, 2011:104).

During hops, it is aimed to maximise the use of the elasticity capacity of the muscle-tendon system. The elastic energy stored by the muscles during the movement is converted into kinetic energy with the jumps and increases the jump height and speed of the athletes.

5.5. Safe Jumps

Safe jumps are an effective type of exercise within plyometric training that aims to increase jump height, strengthen lower body muscular endurance, and develop explosive strength. Athletes perform this exercise by jumping onto a platform of a certain height, usually a box or a crate. Such jumps optimise the coordination and balance of muscle groups, while improving the elasticity of the muscle-tendon system. Özlük (2024) states that muscle jumps greatly improve the performance of athletes in sports that require jumping by increasing lower body explosive strength. The exercises reduce the risk of injury by strengthening the balance control of athletes (Hernandez-Martinez et al., 2023:8).

This type of exercise specifically targets the quadriceps, hamstring and calf muscles and increases the strength capacity of these muscle groups. During muscle jumps, the stretch-shortening cycle, which improves the capacity of muscles to store elastic energy and convert it into kinetic energy, works actively.

5.6. Depth Jumps

Depth jumps are one of the most effective and sophisticated types of plyometric training, aiming to maximise the capacity of athletes to generate explosive power. These exercises consist of movements in which athletes perform a fall from a high platform to a certain distance, followed by a quick jump. This method optimises the production of elastic energy and its conversion into kinetic energy by actively using the stretch-shortening cycle of the muscles. Hernandez-Martinez et al. (2023) stated that depth jumps improve athletes' jump height and sudden movement ability by increasing the elasticity of the muscle-tendon system. This type of exercise is widely used in sports that require explosive strength such as volleyball, basketball and athletics (Arazi and Asadi, 2011:105).

During depth jumps, the elastic energy storage capacity of the muscles is improved as well as the coordination between the nervous system and the muscles. Muscles are stretched during the eccentric phase and an explosive jump is performed in the concentric phase by preserving this energy in the amortisation phase.

6. Methodology

The population of the study consists of young female athletes playing volleyball in Turkey. The sample group was limited to 16 female athletes who were actively playing volleyball and aged between 15-18 years. Participants were selected from volunteer athletes who did not have any health disabilities, who regularly trained, but had no plyometric training experience in the past. In the study, various measurement tools and tests were used to evaluate the effects of plyometric training on balance and jump performance. Weight measurements were carried out precisely using a digital scale, and height measurements were measured with millimetre precision with the help of a stadiometer fixed on a flat surface, while the participants were standing in an upright position without shoes. Information about the other tests performed in the study is given below:

1. Balance Test: Special balance platforms were used to measure static and dynamic balance skills. These devices precisely evaluate the body stabilisation and balance continuity of the athletes.

2. Jump Height Test: Vertical jumping capacities of the athletes were recorded with the help of Optojump digital measuring devices. These devices evaluated the changes in jump height by analysing the data generated during each jump in detail.

3. Jump Performance Test: Vertical and horizontal jumping abilities of the athletes were measured with the help of force platforms. These tests were used to understand the effect of plyometric training on athletes' strength and speed skills.

Data were collected before, after and four weeks following the completion of the training sessions. The measurement results were subjected to statistical analyses to evaluate the changes in the performance of the athletes. The training programmes applied to the participants in the study are shown below:

Tablo 1 : 8-Week Plyometric Training Programme

Week 1-2	Week 3-4	Week 5-6	Week 7-8
Warm-up (10 min) Light jogging, dynamic stretching	Warm-up (10 min) Light jogging, dynamic stretching	Warm-up (10 min) Light jogging, dynamic stretching	Warm-up (10 min) Light jogging, dynamic stretching
Squat Jump (3 sets x 8 reps)	Depth Jump (3 sets x 8 reps)	Single-leg Box Jump (3 sets x 6 reps)	Squat Jump to Box Jump (3 set x 6 reps)
Lunge Jump (3 sets x 8 reps)	Tuck Jump (3 sets x 6 reps)	Lateral Plyometric Push-up (3 sets x 8 rep)	Lunge Jump with Pause (3 set x 8 reps)
Box Jump (3 sets x 6 reps)	Bounding (3 sets x 10 reps)	Depth Jump to Box Jump (3 sets x 6 reps)	Depth Jump to Broad Jump (3 set x 6 reps)
Skater Jump (3 sets x 10 reps)	Medicine Ball Slam (3 sets x 8 reps)	Broad Jump (3 sets x 8 reps)	Medicine Ball Overhead Throw (3 set x 8 reps)
Cool down (10 min): Light jogging, stretching	Cool down (10 min): Light jogging, stretching	Cool down (10 min): Light jogging, stretching	Cool down (10 min): Light jogging, stretching

7. Results

The validity and reliability of the data obtained in the study were evaluated with carefully selected statistical analysis methods. Firstly, the normal distribution of the research variables was analysed and skewness and kurtosis values were examined in this process. All variables were found to be within the limits of normality, which indicates that the necessary conditions for the application of parametric tests are met. This situation revealed that the data obtained can provide reliable results in statistical analyses and provide a valid basis for testing the research hypotheses. Two main analysis methods were used to compare the performances of the experimental and control groups. The first one, Paired Samples T-Test, was applied to evaluate the

differences between the pre-test and post-test results of both groups. This test was used as a critical tool in understanding the effect of plyometric training on the participants. The second analysis method, Independent Sample T-Test, was preferred to reveal the differences between the post-test performances of the experimental and control groups. This test played an important role in assessing whether the differences in performance between the groups were statistically significant. As a result of the analyses, it was determined that plyometric training led to significant performance increases especially in the experimental group. Significant improvements were recorded in physical performance parameters such as vertical jump height, core strength and balance in the experimental group. These findings clearly demonstrated the potential of plyometric training to improve jumping and balance skills especially in dynamic sports such as volleyball. In the control group, the improvements in these parameters were limited and showed low statistical significance. The analyses used in the study were evaluated according to the statistical significance criterion at 95% confidence interval and $p < .05$ level.

According to the socio-demographic findings of the study, the basic variables such as age, height and weight of the participants were analysed in detail. When the mean age of the participants was evaluated, the mean age of the experimental group was 16.73 (SD = 1.03), while the mean age of the control group was 16.87 (SD = 1.19). These findings show that the age range of both groups is quite close to each other and that the study was carried out with participants with a homogeneous age distribution. In terms of height, the average height of the experimental group was 168.33 cm (SD = 6.63), while the average height of the control group was 170.53 cm (SD = 5.22). Although the mean height of the control group was slightly higher than the experimental group, this difference was not considered statistically significant and shows that the general characteristics of the groups were similar. When the findings for the weight variable were analysed, the average weight of the experimental group was calculated as 59.13 kg (SD = 7.28), while this value was 61.27 kg (SD = 7.26) in the control group. This difference observed between the groups in terms of weight indicates that the physical characteristics of the participants in the study were generally similar and that there was no significant imbalance between the groups.

When the pre-vertical jumping averages were examined, the average of the experimental group was 30.20 cm (SD = 6.10) and the average of the control group was 30.40 cm (SD = 4.79). In the pre-long jump distances, the mean of the experimental group was 146,47 cm (SD = 8,96) and the mean of the control group was 150,87 cm (SD = 8,89). In terms of pre-core strength values, the mean of the experimental group was 40.20 seconds (SD = 4.16),

while the mean of the control group was 42.87 seconds (SD = 4.94). In terms of pre-left leg balance scores, the mean of the experimental group was 80.20 (SD = 9.85) and the mean of the control group was 82.33 (SD = 10.05). Pre-right leg balance scores were 82.87 (SD = 7.85) for the experimental group and 84.93 (SD = 7.27) for the control group. According to the data obtained from the post-tests, the post-vertical jump average was 34.20 cm (SD = 5.66) in the experimental group and 30.40 cm (SD = 4.42) in the control group. The final-long jump distance was 155.20 cm (SD = 8.43) in the experimental group and 153.00 cm (SD = 8.17) in the control group. The end-force values were calculated as 45.20 seconds (SD = 4.25) for the experimental group and 41.20 seconds (SD = 5.43) for the control group. Finally, the end-left leg balance score was 89.67 (SD = 10.22) in the experimental group and 82.87 (SD = 8.75) in the control group, and the end-right leg balance score was 92.47 (SD = 7.93) in the experimental group and 86.40 (SD = 7.19) in the control group.

The results of the Paired Samples T-Test conducted to compare the pre-test and post-test results of the experimental group are presented. It was analysed whether the differences between the pre-test and post-test were statistically significant. Significant increases were observed in all variables in the differences between the pre- and post-test averages of the experimental group ($p < .05$). The difference between pre-vertical jump and post-vertical jump was -4.000 (SD = 1.890) and this difference was statistically significant ($t(14) = -8.198, p = .000$). Similarly, the difference between pre and post long jump was -8,733 (SD = 3,575) and this difference was also significant ($t(14) = -9,461, p = ,000$). In the core strength variable, the difference between the pre and post test was -5,000 (SD = 1,195) and this difference was statistically significant ($t(14) = -16,202, p = ,000$). The difference between the left leg balance scores was -9,467 (SD = 2,924) and the difference between the right leg balance scores was -9,600 (SD = 2,444), and both differences were found to be significant ($t(14) = -12,537, p = ,000$ for the left leg; $t(14) = -15,215, p = ,000$ for the right leg). These findings revealed that the experimental group showed significant improvements in physical performance measures in the post-tests.

There are significant differences between the pre and post test results of the control group in some variables. In some variables, no significant differences were observed. The difference between pre and post vertical jump scores was ,000 (SD = 2,360) and this difference was not statistically significant ($t(14) = ,000, p = 1,000$). A difference of -2,133 (SD = 3,852) points was observed between the long jump scores and this difference was borderline significant ($t(14) = -2,145, p = .050$). In the core strength variable,

the difference between the pre-test and post-test was 1,667 (SD = 4,169) and this difference was not statistically significant ($t(14) = 1,548$, $p = ,144$). A difference of -,533 (SD = 2,800) points was observed in the left leg balance scores, but this difference was not significant ($t(14) = -,738$, $p = ,473$). The difference between the right leg balance scores was calculated as -1,467 (SD = 1,642) and this difference was found statistically significant ($t(14) = -3,460$, $p = ,004$). These results show that there was a significant difference only in the right leg balance score in the control group, while there were no significant changes in the other variables.

In the post-vertical jumping test, the mean of the experimental group was 34.20 cm and the mean of the control group was 30.40 cm, and the t-value was 2.049 and the p-value was 0.050. This result shows that there is a significant difference between the experimental and control groups since the p-value is close to the 0.05 limit. In the last-long jump test, the mean of the experimental group was 155.20 cm and the mean of the control group was 153.00 cm, and the t-value was 0.726 and the p-value was 0.474. This result shows that there is no significant difference between the two groups. In the post-chord strength test, the mean of the experimental group was 45.20 seconds and the mean of the control group was 41.20 seconds, and the t-value was 2.248 and the p-value was 0.033. This indicates that there is a significant difference between the two groups. In the post-left leg balance test, the mean of the experimental group was 89.67 and the mean of the control group was 82.87 and the t-value was 1.957, p-value was 0.060. Since this result is very close to the p-value of 0.05, the significance of the difference is open to discussion. In the post-right leg balance test, the mean of the experimental group was 92.47 and the mean of the control group was 86.40 with a t-value of 2.196 and a p-value of 0.037, indicating that there was a significant difference between the two groups.

7. Conclusion, Discussion and Recommendations

While the results of the study revealed the effects of plyometric training on the physical performance of female volleyball players, the findings obtained are in parallel with other studies in the literature. The 8-week plyometric training programme applied in the experimental group provided significant improvements in parameters such as jumping, balance and core strength, while limited changes were observed in the control group. This confirms that plyometric training is a more effective approach compared to traditional methods.

The vertical jump performance of the experimental group increased from 30.20 cm to 34.20 cm. This increase coincides with the results reported by Kanbak (2021) in his study on volleyball players. Kanbak stated that plyometric training optimised the jump height and speed skills of athletes. Similarly, in a study conducted by Gür (2024) on artistic gymnastics athletes, it was reported that plyometric training increased jump height and explosive power. In the control group, no significant change was observed in jump performance, which more clearly demonstrates the effect of plyometric training. In terms of long jump performance, a significant increase from 146.47 cm to 155.20 cm was recorded in the experimental group. Core strength parameter stood out as an important criterion showing the effect of plyometric training. The core strength values of the experimental group increased from 40.20 seconds to 45.20 seconds. . No significant improvement was observed in this parameter in the control group. In terms of balance performance, left leg balance increased from 80.20 to 89.67 and right leg balance increased from 82.87 to 92.47 in the experimental group.

In the study, the improvements in jump and balance parameters of the experimental group showed significant differences compared to the control group. This shows that the improvements observed in the athletes of the experimental group confirm the effect of plyometric training. Similar results were reported in the study conducted by Merkit (2024) on volleyball players. Merkit emphasised that plyometric training provided significant improvements in the general physical performance of athletes. The parametric test analyses used in the study revealed that the differences between the pre-test and post-test results of the experimental group were statistically significant. Obtaining optimum results reveals once again the importance of training planned according to the specific needs of athletes.

The findings of the study showed that plyometric training significantly increased the physical performance development in the experimental group compared to the control group. The results of the experimental group clearly demonstrated the effects of plyometric training on basic physical skills such as jumping, balance and core strength. On the other hand, the performance of the control group showed limited and generally statistically insignificant improvements. These results show that plyometric training is much more effective in increasing the physical capacity of athletes compared to traditional methods. The vertical jump performance of the experimental group increased from 30.20 cm to 34.20 cm and this increase was found to be statistically significant.

The core strength parameter stood out as one of the criteria that showed the effect of plyometric training on athletes most clearly. In the experimental group, core strength increased from 40.20 seconds to 45.20 seconds, while no significant change was recorded in the control group. In terms of balance performance, left leg balance increased from 80.20 to 89.67 and right leg balance increased from 82.87 to 92.47 in the experimental group. These findings show that the experimental group made significant improvements in balance performance and plyometric training was effective on this parameter.

Considering the positive effects of plyometric training on the physical performance of female volleyball players, it is recommended to include this type of training in the development process of young athletes. Significant improvements observed especially in basic parameters such as jumping, balance and core strength confirm the performance enhancing effect of plyometric training. In this direction, it can be said that sports clubs and coaches should regularly include plyometric training in their programmes to improve the physical capacity of young athletes. It is important to design programmes in accordance with individual differences and needs of athletes in order to provide maximum benefit. According to the results of the study, the effect of plyometric training increases with the provision of continuity and appropriate loading principles in athletes' training programmes. In this context, it is recommended that coaches should structure their training programmes based on scientific findings and consider loading-recovery cycles appropriate to the physiological capacities of athletes. In order to increase the effect of training, variables such as frequency, intensity and duration should be regularly reviewed and updated according to individual performance feedback.

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CHAPTER 3

ON THE ELEMENT OF IMPROVISATION IN VOCAL MUSIC EXAMINATION OF VOCAL PAINTING

Hande YILMAZ¹

1. Introduction

1.1 State Of Problem

Music is an essential cultural and artistic form that holds a significant place in all areas and moments of our lives. As an art form, music allows us to convey our emotions and thoughts through compositions that adhere to either defined or undefined rules, using both harmonious and dissonant sounds, or even silence. The uniqueness of musical works lies in their originality. These original creations can differ widely, and within the same piece, individuals can offer unique interpretations, making each performance one of a kind. This is where the element of improvisation in music becomes relevant.

Improvisation is the process of composing in the present moment. Because of its approach, Vocal Painting naturally incorporates improvisation into its framework.

The practices within this method are flexible, allowing for adaptability. In this approach, individuals improvise based on guiding gestures, enabling

¹ Dr., Gazi University, Institute of Educational Sciences, Turkey
handeyilmazofficial@hotmail.com, ORCID ID: <https://orcid.org/0000-0001-5649-1708>

them to express themselves in a personal way while accepting the possibility of errors. The performance allows for mistakes, and individuals learn to experience and comprehend this by making errors during the process. Vocal Painting fosters the creation of new works in real time (Yılmaz, 2024, pp.19).

The objectives of the Vocal Painting method are as follows:

- To enhance communication within the choir.
- To increase interaction within the choir.
- To foster creativity by laying the groundwork for improvisation, boosting both the choir's and individual creativity.
- To focus on the music of the moment and ensure that the choir members remain alert at all times.
- To lay the foundation for innovative practices in vocal music.
- To improve the flexibility of individuals performing vocal music.
- To increase the dynamism of the choir (Baysal, 2023, pp.56).

Vocal Painting facilitates interactive improvisation, which in turn helps develop an individual's improvisation skills. Improvisation can be viewed as the act of creating spontaneously, without prior planning, and in real-time.

Jazz musician and composer Sidsel Endresen describes improvisation as “composing in the moment of movement” (Dillan, 2008, pp. 85).

Improvisation brings uniqueness to musical works, and when combined with interactive improvisation through Vocal Painting, it ensures the distinctiveness of the musical creations. Each performance of the same piece results in a fresh and unique interpretation, shaped interactively according to individual abilities. As a result, this study offers a brief introduction to Vocal Painting and explores its impact on an individual's improvisation skills in vocal music.

2. Method

2.1 Research Model

The study utilized qualitative research methods, including literature review and case study. The literature review involved examining existing sources related to the topic, while the case study focused on analyzing written, visual, and video materials. Additionally, data collection methods like observations were used to gather more detailed information.

2.1.1 Case study

In the study, a case study was conducted, systematically collecting and analyzing data from written, visual, auditory, and video documents related to the research topic. Observations were made, and the results were presented.

A case study is a qualitative research method that involves a detailed examination of one or more events, situations, social groups, or interconnected systems. In this approach, the research subject is defined according to its particular time and place (McMillan, 2000).

Case study is a qualitative research design in which one or more events are examined in depth (Hagan, 2006, as cited in Berg and Lune, 2015).

2.1.2 Literature review

In the study, a literature review was carried out, examining and analyzing sources related to all the relevant topics of the research.

Gash described the literature review process as a thorough and systematic exploration of as many published works as possible on a particular subject (Gash, 1999).

2.2 Importance Of Research

This study is both unique and important as it addresses a topic that has not been explored in previous research. It adds to the limited body of existing literature, offering a valuable resource for future researchers, and enhances the understanding of how Vocal Painting can be used to develop improvisation skills in vocal music.

2.3 Purpose Of The Research

The study aims to determine the impact of Vocal Painting, created by Jim Daus Hjerno, on improvisation skills in vocal music.

2.4 Limitation

The research is limited to the sources that can be accessed through literature review and the data obtained through case study.

3. Findings

3.1 Vocal Painting

Vocal Painting is a newly developed method applicable in music education. It was created to improve dynamics, communication, and harmony in choral music. Drawing inspiration from Soundpainting sign language, performance art, and its approach, Vocal Painting is a technique designed to enhance vocal skills.

Developed by Jim Daus Hjernøe in Denmark, this method currently features 75 distinct signs. Because of the signs it incorporates, it also serves as a type of sign language in vocal music. It is a non-verbal communication system that enables singers and the conductor to improvise freely while staying in sync with the rest of the choir. Usually, the conductor, positioned in front of the group, uses hand and body gestures to give directions for the group to follow in their performance (Yılmaz, 2024a, pp.18).

VOPA is employed to facilitate non-verbal communication between the conductor and singers, enabling the creation of improvised vocal art. The system offers an advanced array of tools to shape and organize the music in real-time. Both the conductor and singers can incorporate elements such as live arrangement, composition, rearrangement, recomposition, key changes, modulations, and time signatures during a performance. Furthermore, it can also be used within traditional repertoires to convey specific details during rehearsals and performances (Vocalpainting, 2025).

This method employs specific gestures (signals) to guide key musical elements during a performance.

These signals convey details about essential aspects such as form, structure, dynamics, tempo shifts, key transitions, harmonization, character and mood, melodic phrases, and the allocation of responsibilities for solos (Nonseid, 2020, pp. 29).

The Vocal Painting method, by its design, helps individuals develop their improvisation skills.

It is closely aligned with the teaching principles of rhythmic music pedagogy, emphasizing rhythm, movement, interaction, improvisation, and ear-based learning (Nonseid, 2020, pp. 7).

3.1.1 The relationship between vocal painting and education

As traditional educational approaches fall short in addressing processes like accessing, utilizing, and generating knowledge, modern education is now guided by contemporary educational principles. These principles prioritize placing the individual at the center, focusing on their holistic development and productivity to achieve educational objectives. Modern education underscores the importance of supporting individuals' overall growth and development throughout the learning process.

In line with contemporary scientific perspectives, education involves fostering an individual's physical, emotional, intellectual, and social capabilities in a manner that best serves both the individual and society. Fundamentally, it is a comprehensive process aimed at the holistic development of individuals to achieve their fullest potential for personal and societal well-being (Yeşilyaprak, 2024, pp.3).

The objectives of modern education can be outlined as follows:

1. Facilitating the psychological growth of individuals,
2. Enhancing their social development,
3. Promoting their physical well-being,
4. Ensuring individuals become fulfilled and productive members of society,
5. Centering education and teaching around the individual,
6. Maintaining the individual's active participation,
7. Equipping individuals with innovative approaches and training aligned with the changes and advancements in the educational process. The Vocal Painting method serves all these aims of contemporary education (Yılmaz, 2024b, pp.95).

Vocal Painting, because of its design and approach, fosters reinterpretation, transformation, and centers on the individual. This characteristic aligns with and reinforces the constructivist approach that dominates modern education.

Contemporary education follows the constructivist model, which asserts that individuals actively shape their experiences through cognitive processes and gain knowledge through a process of restructuring (Spigner-Littles and Anderson, 1999).

The learning process places the individual at the center, promoting active engagement. This approach helps avoid memorization and encourages

individuals to think critically, thereby boosting brain capacity and fostering creativity.

Hundreds of studies conducted worldwide on active learning reveal that rote memorization not only hinders learning but also stifles free thinking, reinforcing one-dimensional thinking (Gürgeç, 2007, pp.4).

Each human brain is unique, which requires the application of diverse methods in the learning process. This can be accomplished through active learning practices that offer students choices and the ability to make decisions regarding their own learning (Açıkgöz, 2003, pp.4).

In the Vocal Painting method, individuals are provided with a system that allows them to make decisions according to their personal preferences. This approach caters to the individual differences in education and proves to be more effective in enhancing their skills.

3.1.2 The relationship between vocal painting and music

In Vocal Painting, gestures such as “palette, palette punch, or memory” are used to revisit previously rehearsed pieces, short riffs, or performances, where the melody is recalled and reintroduced after another performance. While these gestures help in recalling and recreating a melody or returning to a prior performance, they also, alongside other gestures (directions) in Vocal Painting and the interactive improvisations of individuals, facilitate the reinterpretation, alteration, or transformation of existing riffs, melodies, or previously worked music. Through the non-verbal dialogue between the conductor and the singers, new gestures (directions) given by the conductor based on intuition, combined with the singers’ intuitive responses and improvised interpretations, create a unique, intuitive music.

3.1.2.1 Intuitive Music

Intuitive music should be understood not as unstructured music, but as music that unfolds through the performer’s interpretive decisions, shaped by specific guidance during the process (Yılmaz, 2024a, pp.60).

3.2 The Element Of Improvisation

Webster (1987) described improvisation as the expression of sonic structures devised by the musician during their performance (Townsend, 2005, pp.5).

In improvisation, specific qualities are sought both in rhythm and melody. The characteristics sought in rhythmic improvisation are as follows:

- a. Ability to maintain metric beats,
- b. The length of the phrase and ensuring the response matches the length of the question,
- c. The conclusion,
- d. Musical coherence (elements in the question should appear in the response),
- e. Rhythmic organization,
- f. Originality,
- g. Overall musical impression.

The characteristics sought in melodic improvisation are as follows:

- a. Ability to maintain metric beats,
- b. Length of the phrase,
- c. Conclusion,
- d. Musical coherence,
- e. Melodic organization,
- f. Originality,
- g. Overall musical impression,
- h. Ability to maintain tonal integrity (Martin, 1991, pp.100).

Acquiring all of these qualities simultaneously can be challenging for an individual. Vocal Painting helps individuals develop these traits by enabling them to adapt quickly and create music in the moment. However, for successful improvisation, individuals must also be psychologically prepared. During the improvisation process, emotions like anxiety or fear of making mistakes may surface, leading individuals to hesitate or perform within safe, familiar boundaries, thus limiting their engagement with new experiences. Vocal Painting views mistakes as an inherent aspect of the performance process. This approach helps minimize hesitation, increases individuals' confidence, and enables them to perform more freely. Research in the literature has extensively explored the impact on individuals' success, self-efficacy, and attitudes, revealing positive results across these domains.

3.2.1 Vocal improvisation

Vocal improvisation is the spontaneous creation of vocal music without the need for repetition or revision (Gürgen, 2007, pp.42).

It can manifest in various ways: at times, it involves interpreting the lyrics of a song with alternate melodic lines; at other times, it is about forming melodic lines within the piece's existing harmony by using different syllabic patterns; or it can involve exploring the tonality freely by creating melodic lines based on a single vowel or a vowel paired with a consonant.

The style of vocal improvisation that uses syllabic patterns is referred to as "scat singing" or "scatting." Another vocal improvisation approach, developed by Bobby McFerrin and typically performed by a group, is called "circle songs."

3.2.1.1 Scat Singing (Scatting)

Scat singing is often the first style associated with vocal improvisation. It entails converting the voice into an improvised instrument, emphasizing melody, sound, and tone through the use of syllables, instead of relying on the song's lyrics. During scatting, the piece is reinterpreted with different syllables, while still adhering to an overall framework.

Scat singing, originating from vocal jazz, is a type of vocal improvisation where nonsensical syllables, meaningless sounds, or no words are used at all. In scat singing, the singer treats their voice not as a tool for speech, but as an instrument, improvising melodies and rhythms. This contrasts with vocals that involve singing recognizable lyrics over pre-existing instrumental solos (Wikipedia, 2025).

The intentional selection of scat syllables plays a key role in vocal jazz improvisation. The chosen syllables influence the pitch, articulation, tone, and resonance of the performance (Wikipedia, 2025).

3.2.1.2 Circle Songs

Circle songs, in its most basic form, is a style where participants form a circle and engage in improvisation with each other. It is a group singing technique where individuals work together to create music, motivating everyone in the circle to sing, play, and explore new melodies collectively.

The Circle Songs improvisational singing method was created by American vocalist, conductor, and composer Bobby McFerrin during his innovative

exploration of vocal techniques. He is well-known for his distinctive vocal skills and his ability to fuse multiple musical styles (Circlesongs, 2025).

Circle Songs is a group-based practice where individuals participate through call and response, contributing unique vocalizations, global rhythms, rising melodies, lush harmonies, playful sounds, invented language, silence, chants, and laughter. This spontaneous vocal composition is usually performed in a circle or semi-circle. Within this framework, music is created, trust is fostered, risks are embraced, and life is celebrated. Each song and sound finds its place in the circle (Circlesongs, 2025).

The Circle Songs improvisational singing technique requires individuals to have specific musical abilities. A person's individual musical background and skills play a key role in this process.

Bobby McFerrin's Circle Songs concerts are fully improvised. Naturally, having a talented vocal ensemble that can swiftly absorb and perform the evolving musical ideas is essential. In the same way that a soloist needs tremendous energy to add depth and variety throughout an entirely improvised performance, the same level of energy is needed in this setting (Hjernoe, 2016, pp.153).

Circlesongs is a communal improvisation session, but it is also a very personal event (BobymcFerrin, 2025).

3.2.2 Improvisation with vocal painting

There are several techniques, practices, and approaches for vocal improvisation, with Vocal Painting being a novel method that fosters vocal improvisation. What distinguishes this method is its capacity to support individuals not only in enhancing their improvisational abilities but also in improving social interaction and psychological well-being. It aids in alleviating stress and enhancing communication among individuals. These beneficial effects in these areas help accelerate the development of their skills in a positive direction.

This approach, rooted in the individual's musicality, equips singers and conductors with tools to explore rhythm, tone, timbre, interpretation, and expressive possibilities in their performances. When the right conditions are set and singers gain an understanding of their roles within the group (their abilities and potential), it can be truly surprising to witness how they are able to emerge and express themselves. Being part of a musical environment that supports and encourages improvisation can be a liberating experience, offering the chance to rediscover the joy of creating music collaboratively

and singing in response to written scores. This method can be applied to choirs at any level within “rhythmic choral music” (Hjernoe, 2016, pp.148).

Being part of a group performance enables an individual to hear others’ improvisations in the moment, offering the chance to reinterpret their own abilities in different ways. Additionally, it allows them to gain inspiration from others’ improvisations, fostering the development of new creative ideas.

One feature that sets this method apart from other techniques is its capacity to facilitate real-time performance adjustments. When an individual seeks to anchor their performance during an improvisation, they should revise or rearrange their composition with a new gesture (direction) that arises at that moment. This helps the individual stay continuously engaged in the improvisation process. Vocal Painting has been found to enhance individual vocal development and supports personal vocal exercises. However, its effects have primarily been studied through group-based applications in previous research. The first five basic starting gestures in Vocal Painting are depicted below in Figure 1, along with visual representations of the gestures used in VOPA applications.

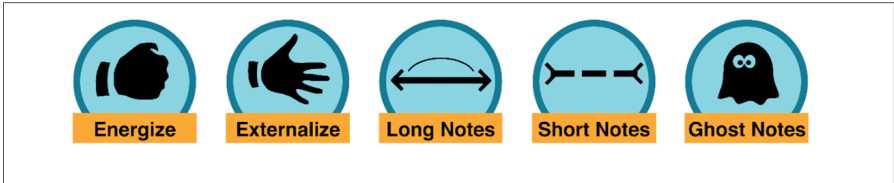


Figure 1. Vocal painting basic starting cues

A musical loop or a known piece can be reinterpreted using these five basic starting gestures. When any gesture is introduced at an unexpected point in the musical loop or piece, it will begin to alter the existing musical structure. This also forms the foundation of improvisation. The meanings of the gestures are explained below in Figure 1.

* When directed to perform the loop or song in an “**energize**” style, performers are instructed to strip away the melodic structure of the piece and continue singing solely with its rhythmic elements.

* When directed to perform the loop or song in an “**externalize**” style, performers are instructed to maintain the melodic structure while singing. If the song was previously performed using only its rhythmic elements, they

should return to singing it melodically, either in its initial melodic form or its fundamental melody from the beginning.

* When directed to perform the loop or song using “**long notes**,” singers are encouraged to render the melody in a legato style (smooth and connected). If indicated as an individual cue, they are expected to produce prolonged, steady tones.

* When directed to perform the loop or song using “**short notes**,” singers are instructed to articulate the melody in a staccato style (short and detached).

* When directed to perform the loop or song using “**ghost notes**,” singers are encouraged to incorporate subtle rhythmic or melodic improvisations either preceding or following the existing notes of the melody. Whether these improvisations are rhythmic or melodic is determined by the prior “energize” or “externalize” cues.

Modifications and variations applied to an existing melody using the initial five basic gestures, combined with subtle improvisations introduced through the “ghost notes” gesture, form the basis of improvisation and enable practice. All directions conveyed through gestures in Vocal Painting are effective for creating new compositions. However, some gestures specifically focus on guiding improvisation. These include “ghost notes, create, solo, melody, relate to, minimalism, spoken word, lyrics, feels like you, scanner, layer scanner, point to point, blinder mode, ext. technique, hit.” Figure 2 below presents visuals of the gestures used in VOPA applications.

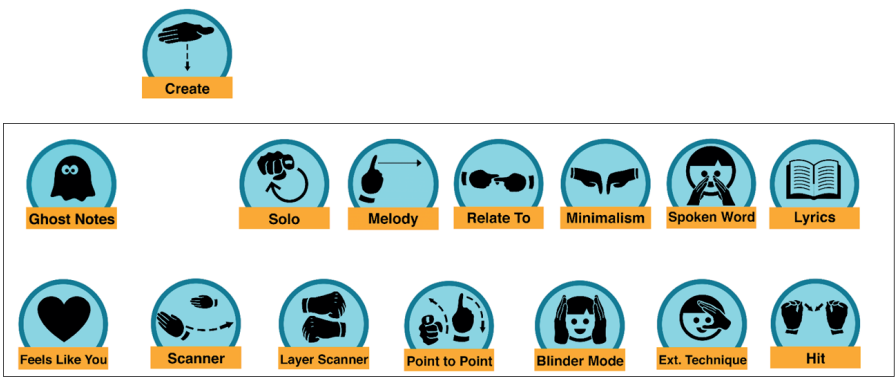


Table 2. Signs leading to VOPA improvisation

Vocal Painting gestures are versatile tools that can be incorporated into vocal performances across all musical genres, enriching and bringing vibrancy to these performances. With the help of VOPA gestures, individuals,

regardless of their age, musical experience, or skill level, can be guided to explore vocal improvisation for the first time. This approach encourages them to uncover their abilities and start crafting their own distinctive creations.

There are no fixed rules for delivering gestures in Vocal Painting. However, for those new to learning Vocal Painting, it may be beneficial for the conductor implementing VOPA to organize and sequence the gestures into a structured syntax, much like in Soundpainting. This method addresses key questions through movement and helps individuals grasp the non-verbal communication of Vocal Painting more effectively.

Question: Who does it? Answer: Group, whole group, rest of group, men, women, you.

Question: What is it doing? Answer: Energize, externalize, long notes, short notes, ghost notes.

Question: How does it work? Answer: volume, tempo, continue...

Question: When does it do it? Answer: off, enter slowly, exit slowly...

The meanings and construction methods of the current 75 signs applied in Vocal Painting can be found in the VOPA application or in Yılmaz's (2024) doctoral dissertation study titled "Vocal Painting Method's Examination with Educational Dimensions and Determination of Its Effects on Choral Education". Those who wish to receive training in this area can do so at the RAMA Vocal Center in Aalborg, in person or online. You can also find concert examples of Vocal Painting at https://musikkons.dk/wp-content/uploads/pdf/Vocal_Painting.pdf.

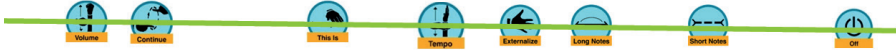
Vocal Painting through gestures can be demonstrated in the simplest manner as illustrated below. The examples provided can be used throughout the entire performance, whether as improvisation, a vocal loop, or any section of it. These are just illustrative examples; each of the 75 gestures in VOPA can be varied through different combinations, presenting limitless opportunities to generate distinctive new improvisations.

In the following graphs, the line represents the melody to be created, a transition, or an existing musical piece, along with their starting and ending points. The shapes corresponding to the VOPA gestures on the graph indicate the example improvisational directions to be applied to the melody.

Example 1:



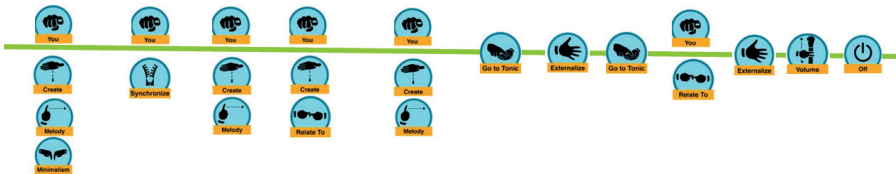
Example 2:



Example 3:



Example 4:



4. Conclusion

The research findings indicate that there is limited literature available on this topic. It was found that the Vocal Painting method is compatible with modern educational philosophies and constructivist approaches. Its use of signals for communication gives it the characteristics of sign language, making it a universal form of communication. Unlike traditional learning methods that follow a fixed style, it allows individuals to make personal decisions and unleash their creativity, enabling them to perform at their own level. This facilitates the creation of a unique style and the development of improvisation skills. The method not only addresses improvisation from a technical or theoretical perspective but also equips individuals with all the necessary skills, preparing them to confidently and effectively engage in improvisation.

This approach can be used to reinterpret existing pieces through variations and transformations, or entirely new musical compositions can be

created spontaneously. Given that the 75 gestures encompass various vocal improvisation styles, it was found that the skills associated with these vocal improvisation techniques can also be developed through this method. By incorporating mistakes as a natural part of the performance process, Vocal Painting helps to reduce hesitation, anxiety, and fear, thereby encouraging individuals to create more confident and innovative works.

Certain gestures in the practice help facilitate transitions to previously learned melodies or songs. This enables individuals to blend a familiar melody into their improvisation, linking the performance to the pre-existing melody. This approach opens up new possibilities for improvisation, encouraging individuals to create distinct performances instead of merely repeating similar ones. Furthermore, the “associate” gestures encourage participants to connect their improvisational work with the performance of others, enhancing the creation of unique and innovative musical improvisations. As a result, the musical output derived from these improvisations is regarded as intuitive music.

Previous studies have shown that while this method was applied to groups, it also offers benefits to individual voices, with noticeable improvements observed. Therefore, it is believed that this approach can be applied in individual voice training as well and can help develop improvisation skills.

In conclusion, Vocal Painting is an interactive approach that enables people to improvise, no matter their skill level or musical experience. It is suitable for all ages, offering the freedom to make mistakes, which in turn builds self-confidence and encourages experimentation with various performances. Even those with minimal improvisational ability can create unique compositions using the 75 available signals. This method allows individuals to enhance their musical abilities in a fun environment, motivating them to continuously explore new improvisations. It incorporates other music teaching methods and serves as a valuable, developmental technique that nurtures creativity and spontaneous creation.

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CHAPTER 4

AN EXAMINATION OF THE RELATIONSHIP BETWEEN SMARTPHONE ADDICTION (NOMOPHOBIA), ACADEMIC ACHIEVEMENT, AND ACADEMIC PROCRASTINATION AMONG UNIVERSITY STUDENTS

Hülya TAĞISOY¹

Eyyüb Ensari CİCERALİ²

Smartphone Addiction

1.1.What Is Addiction

There are many definitions related to the term addiction today. According to the TDK, addiction means “Someone who is overly attached to someone or something financially or spiritually” (TDK, 2022). Based on the above definition, it is possible to say that addiction becomes behavioral or actively connected to the object that exists in front of the individual physically or psychologically. When viewed from this point of view, it is said that

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- 1 Nisantasi University ,Postgraduate education institute, Faculty of Economics, Administrative and Social Sciences, Psychology, Istanbul, Türkiye (international student)
Orcid ID : 0009-0002-1444-4676
 - 2 Nisantasi University ,Postgraduate education institute, Faculty of Economics, Administrative and Social Sciences, Psychology, Istanbul, Türkiye (international student)
Orcid ID :0000-0001-5943-9972

addiction can lead to harmful consequences as a result of the impulses formed in the individual and uncontrolled behaviors (Tansu, 2022). The harmful consequences experienced can lead to impairments in mental and physical functions in individuals. Mental disorders may include depression, anxiety, eating disorders, unhappiness, sleep disorders, neurodevelopmental disorders, schizophrenia, bipolar; physical disorders may include headaches, digestive system disorders, body aches, impaired sexual function, shortness of breath, skin disorders, fatty liver, cancer, etc. When we look at it from this point of view, it may be possible to see addiction in many different areas at the same time. As examples of these areas, many areas such as smartphone addiction (nomophobia), substance abuse, gambling addiction, eating addiction, cigarette addiction, alcohol addiction, drug addiction, shopping addiction can be shown (Metin, 2022; Levent, 2020;).

1.2. What Is a Smart Phone

The smartphone is expressed as a tool that allows individuals to conduct remote communication with each other. It is known that the telephone, which is used as a means of communication in the daily lives of individuals, was first invented by Graham Bell in 1876. With the invention of Graham Bell, it makes it easier for individuals to communicate with each other from a distance (Levent, 2020). When we look from the past to the present, it is seen that smartphones have turned from being a wired communication tool to becoming a wireless communication tool in order to provide communication more easily in all areas. With the developments being made, very fast progress is being made on the phones. With these advances, as a result of the transformation of the existing screen into a touch screen, individuals are starting to take an indispensable position in their lives by starting to meet their needs such as games, listening to music, internet, conversations, mobile applications, bank transactions, easier access to the health field, email (Bal and Balci, 2020; Sarigoz, 2023; Tansu, 2022). When we look at the research conducted, it seems that it is confirmed that the usage characteristics of smartphones are increasing in each new period and that they have an important place in their lives by trying to make them more functional for individuals.

1.3. Definition of Smartphone Addiction

Smartphone addiction is considered one of the subtypes of technology Junkies as a behavioral addiction in which individuals cannot be prevented from using the phone violently without external stimuli and pleasure cravings

while continuing their daily lives. It is seen that the fear and anxiety that they will experience loss of control with out-of-control use of smartphones, which is a type of behavioral addiction, causes them to use the phone more (Sayat, 2023; Yakut et al., 2022). This addiction experienced in individuals leads to the development of tolerance towards the smartphone, the increase in the desire to use it with the tolerance they have developed, and the inability to get satisfaction from the feeling of pleasure that they want to be met. Jun. In addition, the dependence of individuals on smartphones causes them to experience isolation in their social relationships and disruptions in their relationships may occur. On the other hand, it causes the daily activities that he needs to do to be disrupted. This situation also leads to an impact on living standards (Maraş, 2021; Metin, 2022).

1.4. The Effects of Smartphone Addiction

It is known that nowadays the use of smartphones is seen as an indispensable tool. Many reasons make smartphones indispensable, such as the ability to facilitate the work of an individual in life, provide a Decoup Decoupling between daily life events, facilitate communication between individuals. In addition to the positive effects of these devices, which have an important place in the lives of individuals, it is also observed that they have negative effects when they are used uncontrollably and develop addiction to smartphones. The negative effects caused by the development of addiction can lead to impairments in the physical, psychological and social functioning of individuals (Köksal, 2023).

1.4.1. Physical Effects

Physically, some negative effects may occur in individuals who are heavily exposed to smartphones in daily life. These are; shoulder and neck pains that may occur due to the screen level remaining on the lower side of the shoulder when using a smartphone, lower back pains caused by immobility, joint pains, November symptoms such as muscle and nerve tissue damage that may occur on the wrist and fingers may occur. Among the most well-known symptoms related to this, it seems that musculoskeletal symptoms are included. Musculoskeletal syndrome is seen among the disorders in the musculoskeletal system in medical science. Deceleration of musculoskeletal disorders. Nov. In addition, eye fatigue, hearing problems, sleep disorders, headaches are also associated with intense screen time or being connected to smartphones (Metin, 2022; Sarigöz, 2023; Sayat, 2023).

1.4.2. Psychological Effects

Individuals who are dependent on smartphones may be psychologically negatively affected. Constant exposure to notifications on smartphones or technological devices can lead to difficulty in attention recovery and problems with focus, increased small and large accidents that will occur, emotional problems, sleep problems, anxiety, depression, loss of time perception, increased impulsivity, and a feeling of emptiness that may occur due to inability to relate to oneself (Kaya et al., 2021; TÜRÜTGEN, 2023).

1.4.3. Social Effects

Individuals who are constantly exposed to smart devices are breaking away from their social environments and starting to develop more virtual relationships. The virtual relationship they develop makes it possible for individuals to establish and develop false, unhealthy and unsafe relationships due to the fact that they do not know each other directly. Thus, it leads to a distance from the real world, where it should be physically and stay in communication, and to a decrease in real communications, isolation from society, damage to relationships in this context. The smartphone addiction expressed here causes individuals to be directed to unhealthy relationships that are more disconnected from social relationships and to be socially negatively affected (TÜRÜTGEN, 2023).

1.5. Risk Factors in Smartphone Addiction

In research conducted on smartphone addiction, it is mentioned that there are many risk factors depending on age, gender, personality structure, social networks, psychological state, social environment, time spent on a smartphone, and family relationships. It is emphasized that among the reasons for the increase or occurrence of the Deceptiveness experienced, it is formed by the interaction of existing risk factors. According to research, it is possible to reduce or balance smartphone addiction by controlling risk factors in a balanced way (Sarıgöz, 2023).

It is observed that it is common in all age groups due to the need for a smartphone in an individual's daily life. On the other hand, research indicates that the segment where smartphone use is most common is the young segment. When we look at smartphone use and addiction related to gender factor, an equivalent structure is mostly presented in the literature. It is believed that the ease of access to smartphones and the ability to access applications wherever and whenever the individual wants to be portable

increases the risk of addiction. However, the low level of stress and anxiety of the individual and the inability to overcome problems or the events he experiences affect his psychological state and his relationships with his environment, increasing his dependence on the smartphone more (Sayat, 2023; Türlütgen, 2023).

1.6.The Consequences of Smartphone Addiction

Although the use of smartphones in our daily life creates positive effects due to making things easier, it can create addiction as a result of out-of-control use of individuals. The result of phone use with addiction is usually that individuals constantly concentrate on the device, causing them to withdraw from daily activities and experience social isolation. Along with the isolation experienced, it is observed that it also affects physical and psychological problems in individuals. Individuals who constantly bond over an object trigger the fear of being alone by experiencing damage in their relationships and cause the release of many negative emotions. With the strengthening of negative emotions, it is possible to see that a person is experiencing problems with many relationships, such as family, friends, work life, academic success, and the bond he has established with himself. However, it is observed that individuals are developing insecure bonds with themselves and their environment. In fact, it is clearly shown that the results of uncontrolled use of the phones they use to facilitate their daily activities turn negatively to individuals (Tansu, 2022; Türlütgen, 2023). October Dec. 2011; Özçakmak Altınay, H. In addition, the smartphone is among the topics of today with the formation of situations arising from concepts such as “nomophobia”, “FoMO”, “GGK (Fear of missing out on developments)” and “netlessphobia” mentioned in the mental health literature brought by addiction (Maraş, 2021; Özçakmak Altınay, H. 2021; Özçakmak Altınay, H. 2021; Özçakmak Altınay, H. 2021; Özçakmak Altınay, H. 2021)., 2023;).

Nomophobia

2.1. The Concept and Definition of Nomophobia

With the increase in rapidly advancing technology today, it is observed that the use of internet and network connections is increasing in order to keep up with the modern era. Thanks to the network connections that are being used, individuals can handle the workloads in their daily lives more easily (Çakır Özgöz, 2020). Although the advancing technology reduces the workload and saves time, it causes individuals to be able to move away from

communication in the real world, increase interaction on the virtual plane and experience isolation (Göçli, 2022; Koç, 2021). This isolation that is being experienced causes individuals to face various problems by interacting less with their surroundings. One of the problems that we want to mention here is the fear of being separated from the smartphone (anxiety), which is characterized by the name of “nomophobia”. It is observed that as a result of the increase in smartphone use of individuals, unrest, worries and fears increase along with the level of addiction experienced (Demircan Uza, 2019; Sevindik, 2023; Ozlu, 2020).

The first use of the term nomophobia is seen as a concept that emerged as a result of research conducted in the UK. When we look at the origin of the concept, the words “No Mobile Phone” are combined and shortened and used as “nomophopia”, that is, nomophobia in its Turkicized form (Helvacioğlu, 2022; Kadioğlu, 2022). Nomophobia is defined as a type of discomfort that causes individuals to experience restlessness with the fear and anxiety of staying away from smart technological devices (Ekşi, 2020; Ergin, 2020). Today, as a result of the increase in interaction with mobile devices with the advancement of technology, it makes a positive contribution to the ability of individuals to continue their daily lives and also affects them negatively with the dependence on mobile devices (Kars, 2020; Saatchi, 2021; Sengor, 2020).

Academic Procrastination

3.1. Definition of Academic Procrastination

It is known that an individual has many responsibilities in his life today. Academic responsibilities are included among the responsibilities that an individual should do. The individual has many academic responsibilities that he needs to do, such as preparing for the exam, submitting his assignments on time, taking part in projects, increasing his academic development. At some times, these responsibilities that are required to be performed may be too much for the individual and he may show procrastination behaviors. Postponement is expressed as not performing a desired operation or task within the desired time and performing different tasks or tasks. Academic procrastination, on the other hand, can be defined as a subtype of procrastination as delaying or not completing the tasks and responsibilities assigned to the student within the time required to be done, either leaving it to a later date or not (Blunt and Pychyl, 2000; Milgram et al., 1993). Senecal et al. (2003) define academic postponement as the disruption of the responsibilities that the student has

to do by making excuses. Another research is academic procrastination, which is defined by Solomon and Rothblum (1984), is expressed as students' failure to fully fulfill and delay responsibilities such as preparing homework, preparing for exams, preparing for classes, attending classes. When we look at the academic procrastination behavior in general, it is seen that students/individuals have difficulty fulfilling the necessary responsibilities.

3.2.Reasons for Academic Postponement

Individuals have many tasks and responsibilities that they need to do in their daily life and academic life. It is possible to postpone the tasks and responsibilities that need to be done for many reasons. When the literature is examined, it is emphasized that these reasons vary according to each individual. It is observed that individuals who experience academic procrastination have problems managing time due to the constant postponement of responsibilities that need to be done. For this reason, it seems that they either leave many tasks to the last moment or do not do them at all (Toker, 2014; Özkale, 2022). In general, some substances that may cause academic procrastination behaviors in individuals are listed as follows:

- Setting goals above the potential that the individual can do with having a perfectionist structure and trying to achieve
- * The individual is afraid that he will not be able to fulfill the responsibility he has taken, so he avoids the negative consequences that are likely to be encountered
- * Low tolerance of individuals to mistakes and criticism
- * Individuals' anxiety level increases with the fear of failure and avoiding responsibilities in order not to experience the possible anxiety level
- * The individual has problems managing the time related to the responsibilities that need to be done
- * Directing individuals to topics or activities that interest them in different subjects while fulfilling their responsibilities
- Individuals cannot motivate themselves on the responsibilities they need to do, so they avoid responsibilities
- * Deterioration of the environmental conditions of individuals (such as sound, environment, heat, light, working order)
- Ariöz, 2022; Çakmak, 2023; Çelik, 2014; Coşkun, 2022; Demiray Aktay, 2023; Ertan Doğuz, 2022; Gülseven Duman, 2022; Kahraman, 2023;

Kızıltan, 2023) that the individual experiences problems that he cannot overcome in psychological, economic, social and many different subjects (Ariöz, 2022; Çakmak, 2023; Ertan Doğuz, 2022; Demiray Aktay, 2023; Gülseven Duman, 2022; Kahraman, 2023; Kızıltan, 2023).

As a result of research conducted in the literature, it is mentioned that the reasons for academic procrastination may consist of many situations. The development of many coping strategies, such as individuals' motivations, knowledge about time management, determination of goals, ability to control anxiety levels, and prevention of feelings of inadequacy, contribute to reducing academic procrastination.

3.3.Ways to Cope With Academic Procrastination

Procrastination behaviors that individuals encounter frequently in their daily lives bring with them many negative consequences. It is important for individuals to learn and apply ways to cope with academic procrastination in order to minimize the effects arising from this negative situation experienced. Because if this situation that is being experienced is not prevented, the consolidation of procrastination behaviors in individuals may cause it to turn into a habit by increasing. By scanning the literature, some coping methods for academic procrastination have been listed.

Some techniques published by Burka and Yuen (2008) for academic procrastination (act: Toker, 2014):

- * Determination of a behavioral purpose in the subjects that individuals need to study

- * Determination of realistic concrete goals in order to be able to start working with the determination of behavioral purpose

- The completion of the set goal by dividing it into several parts and completing the steps one by one

- Using the time management strategy correctly

- Taking the first step and starting the task regardless of what the subject or conditions are that need to be studied

- * Evaluation of the idle time of the individual with the work to be done

- To be prepared for the obstacles that may be encountered during the study and to continue to work

- * Evaluation and reconsideration of the perfectionist expectations of the individual during the study

* Postponement of situations that may interfere with the individual's working environment, for example, if the phone rings during work and the individual returns to the phone at another appropriate time

* Focusing on the work that needs to be done instead of individuals avoiding making excuses during work

* Focusing on the process rather than the result in the tasks that individuals need to do (Kaya, 2022; Toker, 2014).

Academic Achievement

4.1. Definition of Academic Achievement

The concept of academic achievement is among the most frequently mentioned and focused Deceptions in recent times. Success is defined as the ability of individuals to achieve the desired goal. Academic success, on the other hand, is referred to the ability of students to reach the level of competence they show in the education given within a certain program and achieve success (Çimşir, 2019; Karaman, 2020). It is thought that success in education will be difficult in the developing world. It is thought that many doors will be opened with this power obtained. In the research conducted, it is assumed that the way to achieve success is through educational institutions. Educational institutions are trying to prepare individuals for life spiritually, cognitively and emotionally. It is seen that individuals who are spiritually, emotionally and cognitively ready for life can cope with the problems they face more easily and be more successful (Avalanche, 2023; Soykan, 2021).

When we look at the field literature about the concept of success, it is seen that many definitions have been made. According to Goode and Merkel (1973), success is expressed as getting the expected scores by providing the success criterion determined in educational institutions. According to Göller (2010), success is defined as the ability to achieve the desired goal in educational life. Koç (1978), on the other hand, explains success in the form of achieving achievements together with the grades obtained by evaluating teachers and exam results.

The Model of The Research

In this research process, the relational screening pattern, which is a quantitative research method, is used. As a relational screening pattern, it is performed in order to predict the effect of the moderator (Decider) variable on the relationship between the dependent and independent variable. In

this research, Personal Information Form, Nomophobia Scale, Tuckman Academic Procrastination Scale and Academic achievement inventory are used as measurement tools.

Universe and sampling

The universe of this research consists of students studying at Istanbul Gedik University in Turkey. This research was applied to the Ethics Committee of Istanbul Nişantaşı University and data collection stage was started by making an ethical compliance decision in order to conduct the research. 300 Students participated in the research. According to the results obtained, it was stated that 57.3% of the 300 people who participated in the research were women (172 people) and 42.7% were men (128 people). According to the marital status of the participants, 65.3% (196 people) are single, 22.7% (68 people) are married, 8.0% (24 people) are divorced or widowed, and 4.0% (12 people) are individuals living together. In terms of education levels, it is seen that 71.7% of the participants (215 people) are bachelor's graduates, 20.0% (60 people) are master's graduates and 8.3% (25 people) are associate degree graduates. When the places where the participants live are examined, it is understood that 59.3% (178 people) live with their family, 14.0% (42 people) stay in places such as dormitories, hostels or apartments, 11.0% (33 people) live alone at home, 10.7% (32 people) live with friends at home and 5.0% (15 people) live with relatives. When the sibling status was examined, 78.3% of the participants (235 people) had a sibling, while 21.7% (65 people) did not have a sibling. In terms of hobby status, 76.3% (229 people) have any hobby, while 23.7% (71 people) stated that they do not have a hobby. In terms of daily phone usage time, 47.3% (142 people) stated that they use their phones between 4-6 hours daily, while 30.0% (90 people) said that they use their phones between 1-3 hours, 18.7% (56 people) for more than 7 hours and 4.0% (12 people) for less than 1 hour. The most stated reason for using a phone as a purpose of use is social media, and 48.7% of the participants (146 people) stated that they use a phone for this purpose. This is followed by communication with 22.0% (66 people), homework with 10.3% (31 people), video watching with 9.7% (29 people) and gaming with 9.3% (28 people), respectively.

The hypotheses of the research

As a result of this study, the hypothesis that "Procrastination behavior is a regulatory (moderator) variable in the relationship between smartphone

addiction (nomophobia) and academic success” is confirmed in university students.

The hypothesis that “Age is the regulating (moderator) variable in the relationship between smartphone addiction (nomophobia) and academic achievement” among university students is not confirmed by the study conducted /

As a result of this research, the hypothesis that “The number of friends is a regulating (moderator) variable in the relationship between smartphone addiction (nomophobia) and academic success in university students” is not confirmed.

This study shows that the hypothesis that “Daily phone usage time is a regulatory (moderator) variable in the relationship between smartphone addiction (nomophobia) and academic achievement in university students” is not confirmed.

As a result of the study, the hypothesis that “GPA is a regulatory (moderator) variable in the relationship between smartphone addiction (nomophobia) and academic success” among university students is not confirmed. Dec.

As a result of the research, the hypothesis that “Weighted grade point average (ANO) is a regulatory (moderator) variable in the relationship between smartphone addiction (nomophobia) and academic success” in university students is not confirmed.

The study shows that the hypothesis that “Gender is the regulating (moderator) variable in the relationship between smartphone addiction (nomophobia) and academic achievement” in university students is not confirmed.

With this study, the hypothesis of “Having a sibling is a regulatory (moderator) variable in the relationship between smartphone addiction (nomophobia) and academic success” in university students is not confirmed.

With this research, the hypothesis that “Marital status is a regulating (moderator) variable in the relationship between smartphone addiction (nomophobia) and academic achievement” is confirmed in university students.

The research confirms the hypothesis that “Smartphone addiction (nomophobia) is a regulatory (moderator) variable in the relationship between academic achievement and smartphone use Decency” in university students.

DISCUSSION

Within the scope of the research, nomophobia becomes significant in the relationship between smartphone addiction (nomophobia) and academic success in university students with the inclusion of academic procrastination behavior in the model. Our first hypothesis has been confirmed. This shows that the Decadal procrastination behavior functions as a moderator variable in explaining the relationship between nomophobia and academic achievement and helps to better understand this relationship. When the studies conducted in line with the findings obtained from the research are examined, Aksogan and Atıcı (2022), which is a similar subject, concluded that there is a low positive relationship between nomophobia levels and academic procrastination behaviors in university students in his study on nomophobia. Baykan et al. (2021) in a study conducted on medical students, it is stated that there is a positive relationship between nomophobia and academic Deceleration, emphasizing that unconscious use of the Internet brings problems. Balkis and Duru (2010) found in their study “Academic procrastination tendency, the role of general and performance self-esteem in academic achievement relationship” that students’ academic achievement level decreased as a result of increasing academic procrastination. In a study conducted by Demir and Kutlu (2017) on adolescents, it is concluded that while internet addiction affects academic procrastination at a moderate level in a positive direction, academic procrastination affects academic achievement in a negative direction.

With the inclusion of the age variable, which is the other factor considered in the study, into the model between nomophobia and academic achievement, it is seen that age does not have a role on the relationship between nomophobia and academic achievement as a moderator variable in the hypothesis. When the researches conducted in the literature are examined, it is stated that as a result of the study conducted by Öz and Tortop (2018) with university students, the levels of nomophobia do not differ according to the age variable. Another similar conclusion is expressed in the study conducted by Hoşg (2020) that there is no significant relationship between nomophobia and age variables. A study conducted on teachers by Yildiz et al. (2020) shows that nomophobia levels differ according to the age variable and that teachers aged 21-25 have high nomophobia compared to teachers over the age of 40. Güler and Veysikarani (2019) As a result of the research conducted on nomophobia in university students, it is concluded that the age variable has a significant effect on device deprivation, which is the sub-dimension of nomophobia.

Within the scope of the research, it is determined that the relationship between nomophobia and academic achievement does not have a role on the variables of the number of friends considered as the moderator variable. However, when the results are examined, it is stated that the number of friends predicts academic success as a moderator variable. In short, it is observed that the academic success of individuals increases as the number of friends increases. When looking at the research conducted in the literature, it is stated that when Karaman (2024) looked at the relationship between the friend variable and the nomophobia variable in his study on nomophobia at the vocational high school, there was no statistically significant difference. Yıldırım (2000) in his study on high school students, it is seen that the support they receive from friends, teachers and their families positively affects their academic success. In other words, it has been shown that the number of friends of students and the support they receive from friends affect their academic success. Kapıkıran and Özgüngör (2009), in their research on adolescents, predict the academic achievement levels of many variables such as the number of siblings, parents' education levels, school type as well as the friends of individuals significantly. Within the scope of the literature, adequate results cannot be reached due to the low number of studies that specifically link nomophobia and academic achievement with the number of friends. However, it is recommended to conduct research on the direction in which the number of friends affects nomophobia and academic achievement.

Looking at whether the daily phone usage time, which is considered as another variable, has a role as a moderator variable, it is shown that it does not have a role on academic achievement with nomophobia, but the daily phone usage time plays a role on academic achievement as a moderator variable. Statistical data show that academic achievement decreases as the daily phone usage time increases. Making it easier for individuals to access smartphones brings problems along with having an important role in their lives. Among these problems, it is seen that with the increase in usage time, they are faced with becoming addicted to the smartphone, Decried as nomophobia, and that it takes over their lives. In addition, it is seen that individuals physically withdraw their presence from life and move away from society by increasing their digital presence on smartphone networks (Gezgin et al., 2017). From this point of view, when we look at the research that nomophobia is related to the addiction of phone usage periods, the following results are reached. In a study conducted by Erdem et al (2017), it is mentioned that there is a positively significant relationship between nomophobia and the duration of daily phone use. This shows that nomophobia also increases when the phone usage time increases. When we look at the research conducted by Yıldırım

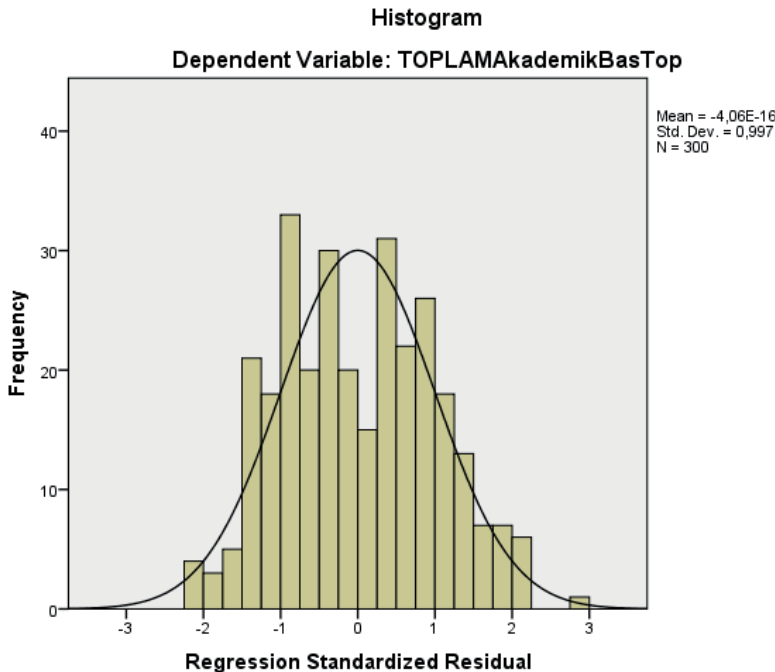
et al. (2016), it is seen that there are similar results. However, in literature research, Gezi et al. (2017) found that in a different study conducted on prospective teachers, they stated that there was no significant difference when looking at the duration of smartphone use. In a study conducted by Joshi (2024), it is said that in addition to certain exercises, it has been found that reducing phone usage time and even switching it off are effective in reducing nomophobia levels.

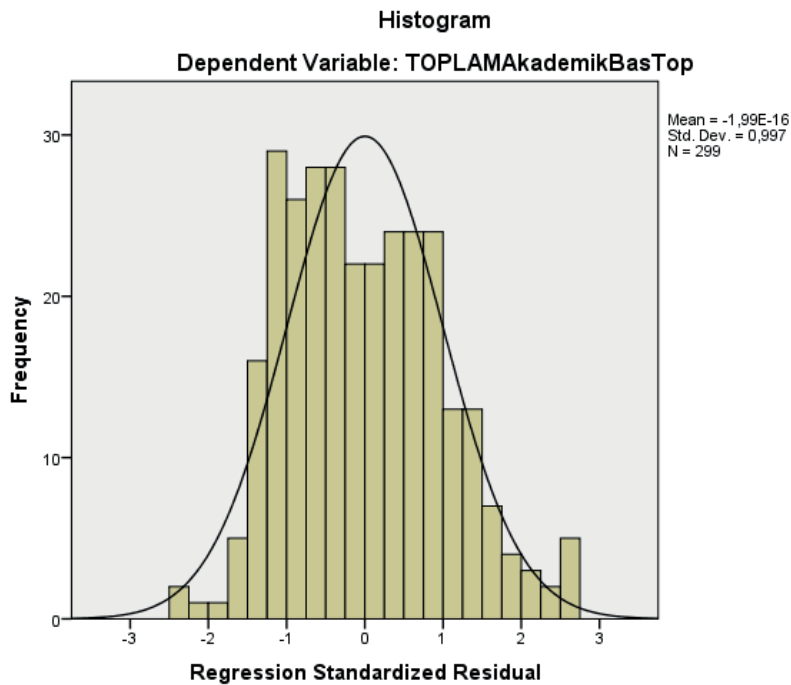
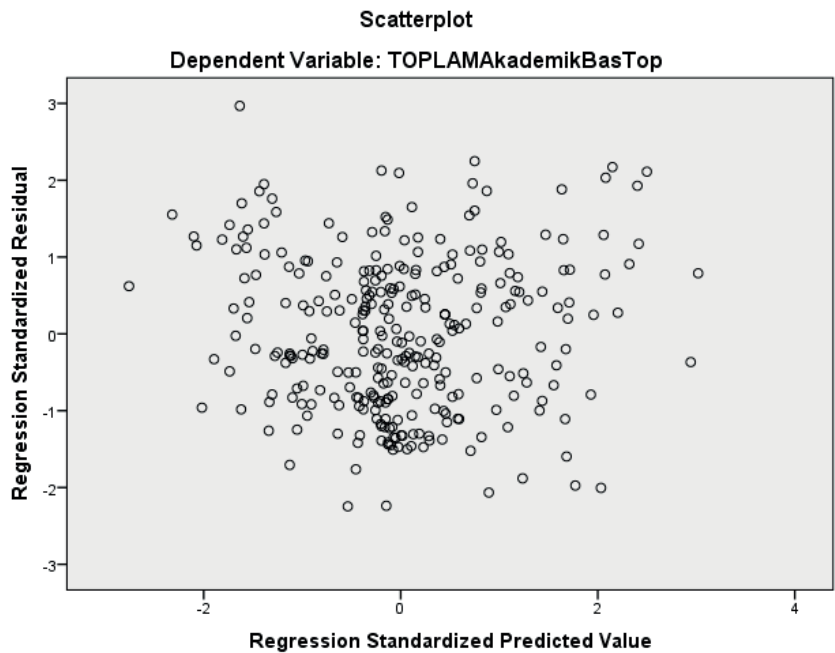
In the research, it is determined that the GPA of university students has no role on academic achievement with academic phone addiction as a moderator variable. On the other hand, although the results obtained here show that the overall grade point average has no role in the relationship between nomophobia and academic achievement, they show that the overall grade point average directly affects academic achievement and has a predictive relationship. When the literature on this subject is examined, Özsavran and Ayyıldız (2022) stated that there is no significant difference between the nomophobia scale and the sub-dimensions of the overall grade point average values of the students in a study conducted on university students at a vocational high school in Zonguldak . Şemuer et al. (2018) When looking at the results of the examination of the factors affecting the smartphone use of university students in the course, as opposed to the course, with the GPA, it is found that there is a significant low-level negative relationship between the GPA and the Özalp et al. (2021) results of a study conducted on the factors affecting nomophobia levels for male university students show that there is a significant relationship between the level of nomophobia and the GPA. When we look at the literature researches related to the effect of nomophobia on the GPA, it is seen that nomophobia affects the general averages of individuals in various aspects.

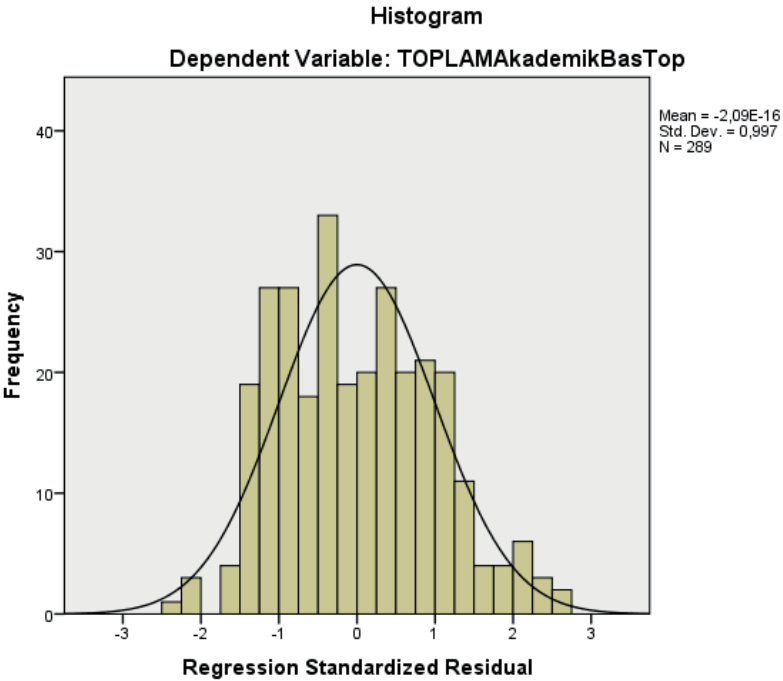
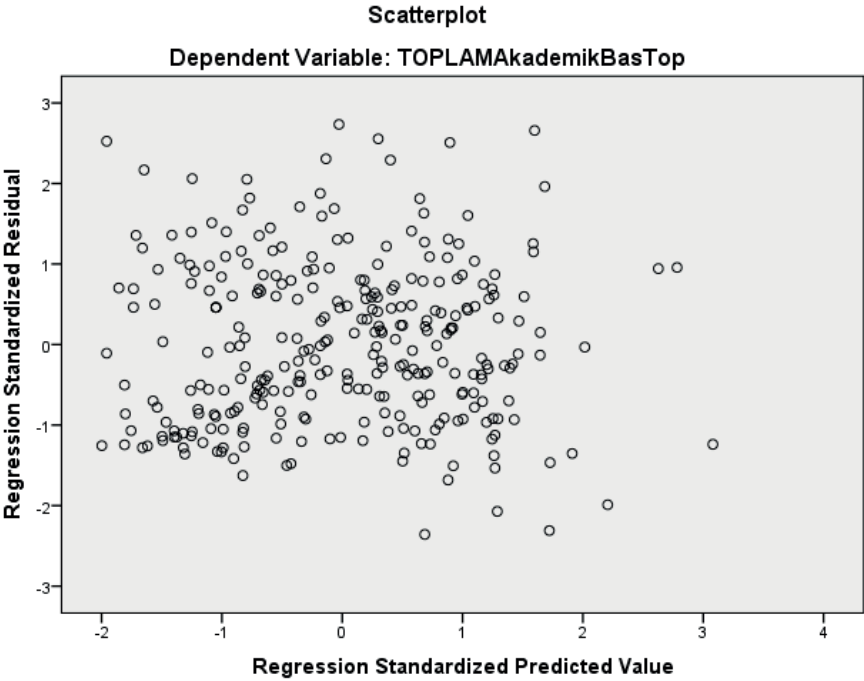
Within the scope of the research, it is determined that the gender variable does not have a role on academic achievement with smartphone addiction as a moderator variable. There are many studies in the literature showing the effect of nomophobia on gender. If we talk about some of these, let's talk about; In his The difference between gender in terms of nomophobia in Turkey: a meta-analysis study, Avcı (2022) reveals that women are more nomophobic than men as a result of meta-analyses, emphasizing that technology has negative effects as well as making life easier. In the study "Do age, gender and poor diet influence the higher prevalence of nomophobia among young people" by Moreno-Guerrero et al (2020), it was concluded that nomophobia rates of female individuals are higher than male individuals with findings similar to the results of the study conducted by Avcı (2022). Arpacı et al. (2019), in their research "A multi-group analysis of the effects of individual differences

in mindfulness on nomophobia”, mentioned that gender awareness has a serious impact on nomophobia and that the nomophobia rates of individuals who increase their awareness decrease. Erdem et al. (2017) emphasize that in their study on nomophobia, they found that there is a significant difference in the levels of nomophobia of women compared to men. When we look at the research conducted, it is possible to see the negative states of nomophobia in terms of both sexes.

In the study, it is determined that having a sibling does not have a role in the results obtained when looking at whether the role of having a sibling as a moderator variable between nomophobia and academic achievement . When we look at the studies conducted in the literature, Aygun et al. (2023) When we look at the study “A research on nomophobia: High school students example”, it was found that while students with fewer siblings observed differences in communication skills compared to students with more siblings, there was no difference in the data of inability to access information, abandonment of convenience, and loss of online connection according to the number of siblings. In his study “An investigation of secondary school students’ motivation and addiction towards digital gaming by age gender and number of siblings” conducted by Kablan (2024), it is said that smartphone use does not have a relationship with the number of siblings or whether there are any in the results in the field of digital gaming addiction.







Conclusions And Recommendations

The data obtained as a result of the study shows that the hypothesis that academic procrastination behavior is a regulatory variable in the relationship between smartphone addiction (nomophobia) and academic achievement has been confirmed, and it has been concluded that other hypotheses (age , number of friends, daily phone usage time, GPA, weighted GPA, gender, sibling ownership, marital status, smartphone usage purpose) have not been confirmed. In the future studies, the research to be conducted in this field can be expanded by exhibiting more different perspectives. As the sample of this research is made up of university students, seminars can be organized at the university about how smartphone addiction affects academic achievement and academic procrastination. In these seminars, suggestions about reducing the level of smartphone addiction can be presented. The sample of this research we conducted consists of 300 participants and only university students. It is thought that a more comprehensive and healthy result will be achieved with a wider sample of different age groups and different education levels in the studies to be conducted after this. Since the relational screening pattern is used in this research, it is not possible to establish a healthy cause and effect relationship. It is suggested to use other research models (experimental) in the future studies.

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CHAPTER 5

THE USE OF DIGITAL GAME DESIGN IN EDUCATION: DEVELOPING A MEMORY CARD GAME WITH THE CONSTRUCT GAME ENGINE

Utku KARA¹

Yusuf Furkan ÇİLİNGİR²

Ozan Umut KARA³

Musa KAPLAN⁴

1. Introduction

21st century skills are the basic competences required for individuals to find solutions to the challenges they face in education and business life and to adapt to complex life conditions. These skills are a combination

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- 1 Teacher, Child Development and Education PhD Student, Karabük University, Health Sciences, Child Development, Karabük, Türkiye, 0000-0002-1024-889X, utkukara35@gmail.com
 - 2 Karabuk University, The Institute of Graduate Program, Child Development and Education, Karabük, Türkiye, 0009-0004-2492-0298, yusuf123171@gmail.com
 - 3 Master's student with thesis at Dokuz Eylül University, Institute of Educational Sciences, Department of Guidance and Psychological Counseling, İzmir, Türkiye, 0009-0009-9448-0079, ozanumutkara@gmail.com
 - 4 Karabük Provincial Directorate of National Education, Principal of Cumayanı Schools, Karabük, Türkiye, 0009-0004-4718-4166, musakaplan2014@gmail.com

of knowledge and abilities obtained from individuals' lifelong learning processes, educational experiences and various achievements. Therefore, they have an important role in both career and personal life success of individuals (Sopianingsih ve Lukman, 2022). In particular, skills such as **communication, collaboration, critical thinking, creativity and problem solving** have a key importance for individuals to achieve both academic and professional success. **Communication skills** are based on the process of transmitting a message by a sender and understanding it by a receiver. This process can be realised through verbal, written and non-verbal communication methods as well as technologies and different media tools. Effective communication skills enable individuals to establish strong interactions in social and professional contexts and the development of these skills is recognised as a fundamental requirement for success (Ananiadou ve Claro, 2009; Katz, 2007; Levy ve Murnane, 2004). **Collaboration skills**, on the other hand, facilitate individuals to reach common goals by working in a team and support team members to contribute harmoniously with complementary skills (Wang, 2010; Dede, 2009). On the other hand, **critical thinking skill** covers the process of analysing the information obtained by questioning, making informed decisions and applying appropriate reasoning methods. This skill includes thinking methods such as induction and deduction and plays an important role especially in problem solving processes (Van Laar et al., 2020). **Creativity skill**, on the other hand, enables individuals to develop approaches from different perspectives by generating innovative ideas, to analyse and apply these ideas more effectively, and to contribute to the development of products, services or processes that can be used in the business world (Bronstein, 2003). Finally, **problem solving skills** include a set of competences required to find effective solutions to complex and challenging situations. These skills enable individuals to adapt to the changing needs of the 21st century and make meaningful contributions to society (Gut, 2011). In general, 21st century skills constitute a critical foundation for individuals to be successful in various areas of their lives

The necessity for individuals to develop 21st century skills is critical not only for personal success, but also for adapting to the new needs created by technological transformations such as Industry 4.0 in the world of education and business. In this context, it is of great importance to address the concept of Industry 4.0 and its relationship with 21st century skills in line with the studies in the literature. The concept of Industry 4.0, which was first used in Germany in 2011, has made it mandatory for all sectors of society to adapt by using more digital technology in order to continue their activities in a sustainable manner. The COVID-19 pandemic has further accelerated this

transformation process. The education system has also been affected by this change and has had to adapt to the industrial needs and values of that era as in every period (Aliyu ve Talib, 2020). This adaptation process has made competencies such as creativity, problem solving, decision making, analysis and research skills increasingly important (Mourtzis, 2018; Kipper et al., 2021). In addition, technological innovations emerging with Industry 4.0 and the need to reshape the education system through these innovations have led to the emergence of the concept of **Education 4.0**, which aims to adapt to the requirements of Industry 4.0 in education and to develop the necessary skills in this industry. According to Fisk (2017), there are nine basic principles that define Education 4.0: (1) the learning process is not limited to a specific time and place; (2) a learning approach that is customised to the needs and abilities of students; (3) allowing students flexibility in the choice of tools and resources to be used; (4) encouraging project-based learning; (5) providing hands-on and experience-oriented activities such as internships, mentoring and collaborative projects; (6) the extraction of logic and trends through data interpretation; (7) the use of new assessment methods that assess knowledge through application in field projects; (8) the active contribution of students to the development and revision of the curriculum; and (9) the increasing independence of the learning process. In line with this information, when the literature is analysed, it is seen that individuals who are involved in an education process in accordance with Education 4.0 standards have the potential to acquire the digital skills required by the 21st century

In the 21st century, digital skills include the application of core competences such as knowledge, communication, collaboration, critical thinking, creativity and problem solving in digital contexts (Amabile, 1988; Funke et al., 2018; Van Laar et al., 2017). These skills can be developed through application and practice or can be acquired in learning processes (Amabile ve Pillemer, 2012). Especially the integration of problem solving skills with digital skills has become increasingly important with the increasing use of information and communication technologies (ICT) (Gagné, 1985; Mainert et al., 2018). This integration includes the processes of individuals acquiring new knowledge, actively searching for this knowledge, and applying the acquired knowledge to produce solutions (Karakaya ve Demirkan, 2015; Kuo ve Hwang, 2014; Dumas et al., 2016). In terms of knowledge acquisition and management, the abundance of information provided by digital environments requires individuals to develop the skills of searching, evaluating and organising information (Bawden, 2008; Brandtweiner et al., 2010; Eshet-Alkalai ve Amichai-Hamburger, 2004). Developments in communication technologies have enabled individuals to communicate more quickly and effectively at a

distance; tools such as teleconferencing services have enabled individuals to easily interact across time, space and distance boundaries (Gui ve Argentin, 2011; Mossberger et al., 2003). Collaboration processes are also increasingly supported by technological developments; ICT supports the development of digital collaboration skills by providing tools that facilitate team members to share information and perform tasks online (Wang, 2010). Critical thinking is a necessary skill for individuals to make knowledge-based evaluations in both real and virtual situations and to present critical arguments in online discussions. In this context, individuals' ability to analyse, evaluate and reflect on information is critical in today's digital age (Yu et al., 2010). The existence of digital technologies allows creativity to be both supported and facilitated. Creative thinking processes are enriched by digital tools in a wide range from the formation of ideas to their implementation. Digital platforms enable individuals to develop unique ways for innovative creations (Loveless, 2007; Lai ve Yang, 2014; Lessig, 2008). In particular, user-generated content has become a concrete example of creative practices on online platforms. In addition, the success of these contents is largely evaluated by the acceptance and appreciation of the audience (Barak, 2018; Jenkins et al., 2019; Lemke, 2002). These creative processes supported by digital technologies provide opportunities for individuals not only to generate ideas, but also to learn and improve themselves through interactive sharing and evaluation of the content they produce. This situation plays an important role in individuals acquiring the digital skills required by the 21st century and effectively integrating these skills into educational processes. The opportunities offered by digital technologies have become one of the basic building blocks of the 21st century education system by encouraging innovative educational approaches at both individual and social levels (Çaydere ve Akgün, 2023). Digital game-based learning and education-based digital game design stand out as an effective method that increases student motivation by making learning more interactive and fun. Research shows that game-based learning plays an important role in the development of 21st century skills such as critical thinking, problem solving and collaboration (Gee, 2007; Boyle et al., 2016). In addition, it is stated that the game design process encourages creative thinking and enables students to actively participate in knowledge (Salen ve Zimmerman, 2004). Well-designed digital games used in education provide students with opportunities to deal with real-world problems, making the learning process more meaningful and context-based (Whitton, 2010). Therefore, digital game design is considered not only as a tool of technology in education, but also as an applicable area of pedagogical innovations.

In educational research, there is a growing interest in the impact of digital games on learning (Ke, 2009). Previous research on games in education shows that the most commonly examined outcome is knowledge acquisition (Connolly et al., 2012; Li ve Tsai, 2013), with a large number of studies examining the effects of game-based learning in various disciplines such as science and social sciences (Boyle et al., 2014; Connolly et al., 2012; Dempsey et al., 1994; Emes, 1997; Vogel et al., 2010; Yu et al., 2010). While some of the studies address problem solving skills (Li ve Tsai, 2013), it is seen that affective and motivational outcomes are generally examined within the framework of entertainment-oriented game studies (Connolly et al., 2012). However, there is not a complete consensus in the literature on the positive effects of game-based learning. For example, some studies suggest that this approach can be more effective than traditional classroom teaching, increase students' motivation to learn, and offer them the opportunity to gain new knowledge and skills (Boyle et al., 2014; Dempsey et al., 1994; Vogel et al., 2006). However, other studies have not found a strong relationship between game-based learning and academic achievement or psychological development (Emes, 1997)

In the literature, more and more researchers have developed educational games to support the teaching of 21st century skills (Boyle et al., 2014; Dondlinger, 2007). However, there is limited information about the effects of these games on students' 21st century skills development (Ebner ve Holzinger, 2007; Ke, 2009; Papastergiou, 2009; Van Eck ve Dempsey, 2002). 21st century skills cover a wide range of learning and innovation skills as well as information, media and technology skills (Binkley et al., 2014). These skills have received increasing attention from both researchers and practitioners (Chan ve Yuen, 2014; Gee, 2007). For example, the current school curriculum in Hong Kong places special emphasis on the development of students' creativity skills, and in this context, teachers are encouraged to adopt innovative teaching methods to encourage students' creativity (Chan ve Yuen, 2014).

When we look at traditional educational approaches, it is seen that a single correct answer is generally emphasised and failure is made a high-risk situation. In addition, the prioritisation of standardisation and conformity creates an obstacle that limits students' creativity (Plucker ve Makel, 2010). Moreover, the assessment of 21st century skills is limited to traditional methods such as popular standardised tests. In contrast, digital games support the development of 21st century skills that are becoming increasingly valuable in the new digital economy (Gee, 2008; Squire, 2011;

Van Eck, 2012). At the same time, they offer an alternative tool to traditional assessment methods for measuring these skills (Shute, 2011).

In conclusion, digital games go beyond traditional educational approaches and offer an innovative learning model that can respond to the changing needs of the 21st century. In particular, digital games have the potential to develop 21st century skills such as critical thinking, creativity, collaboration and problem solving (Gee, 2008; Squire, 2011; Van Eck, 2002). In addition, digital games offer an alternative approach to traditional assessment and evaluation methods by making learning processes contextual, active and problem-based (Shute, 2011). In this context, well-designed digital games stand out as an important tool for improving students' knowledge-based thinking and creative problem solving skills while increasing their motivation to learn (Boyle et al., 2014; Connolly et al., 2012). However, more empirical studies are needed to understand the impact of these approaches on the education system in depth (Dondlinger, 2007; Ke, 2009).

Research on the role of digital game design in education can provide important clues about how game-based learning processes shape the pedagogical knowledge and attitudes of child educators (classroom teachers, pre-school teachers and child development graduates with pedagogical formation). For example, participation in digital game design processes can positively influence pre-service teachers' attitudes towards digital tools and enable them to better understand the role of these tools in education (Ke, 2009; Papastergiou, 2009). In addition, game design training can be an important tool in developing teachers' skills in using digital game engines and other technological tools for pedagogical purposes (Van Eck & Dempsey, 2002). In this framework, examining the knowledge levels and attitudes of child educators (classroom teachers, pre-school teachers and child development graduates with pedagogical formation) before their participation in digital game design processes is considered as a critical step to understand the change in attitudes and skills towards the use of digital tools in education over time. In this context, a visually based and user-friendly game engine such as **Construct-3** offers an effective tool to develop educators' digital skills and enrich their pedagogical approaches. Construct-3, as a platform developed especially for users with no programming knowledge, simplifies complex coding processes and enables drag-and-drop game design. This feature allows educators to quickly gain game development skills and use digital technologies more effectively. Educators' use of such a tool in digital game design contributes not only to their own professional development but also to students' development of 21st century skills such as critical thinking, problem solving and creativity. The fact that games designed with Construct-3

can be used on many platforms such as web, mobile and desktop increases the accessibility of learning materials and makes educational processes more efficient. Therefore, it can be said that educators who actively participate in digital game design processes play an important role in terms of both developing their own pedagogical competences and supporting students to adapt to the requirements of the digital age. In the light of this information, the problem and sub-problem questions of the research are as follows:

- **Research Problem Question:**

How does participation in digital game design processes affect the attitudes of child educators (classroom teachers, pre-school teachers and child development graduates with pedagogical formation) towards the role of digital tools in education and their digital game design skills?

- **Sub Problem Questions:**

1. What are the knowledge levels of child educators (graduates of classroom teaching, pre- school teaching and child development graduates with pedagogical formation) before their participation in digital game design processes and their attitudes towards digital tools?
2. How does participation in digital game design training change the digital game design skills of child educators (classroom teachers, pre-school teachers and child development graduates with pedagogical formation) and their attitudes towards the use of these skills in classroom practices?
3. How does the game design process developed by using digital game engines contribute to the understanding of the pedagogical potential of digital tools by child educators (classroom teachers, pre-school teachers and child development graduates with pedagogical formation)?

2. Methods

2.1. Data Collection Methods

In this study, qualitative data collection methods were preferred in order to understand the participants' experiences, thoughts and changes in the education process in depth. In this context, pre- and post-interviews were conducted using a semi-structured interview form (Yıldırım & Şimşek, 2021). Semi-structured interviews provided flexible and detailed data

collection within the framework of questions determined in accordance with the main purpose of the research.

- **Preliminary Interview Questions:** During the pre-interview process, the focus was on the participants' existing knowledge, attitudes and previous experiences on digital tools and digital game design. The questions asked in this context are as follows:
 1. What are your experiences in using digital tools in education and your thoughts on the role of these tools in education?
 2. Have you had any experience with digital game design or game engines before? How do you think digital game design can contribute to your education?
 3. If you are planning to study digital game design, how do you think this process will contribute to your professional development and teaching practices?
- **Final Interview Questions:** After the training was completed, a final interview was conducted to understand the changes in the participants' knowledge, skills and attitudes towards digital tools and game design. The questions asked are as follows:
 1. How do you think your knowledge and skills about the role of digital tools in education and digital game design have changed after the training process?
 2. How did your participation in the digital game design process contribute to your educational practices and professional development?
 3. Do you plan to integrate the digital game design skills you learnt during the training process into your classroom practices? If yes, how do you plan to use these skills?

A structured process was followed in order for the pre and post interview questions used in the research to produce valid and reliable results. In this process, the applications of the concepts of validity and reliability in qualitative researches were taken into consideration and the following methods were applied:

- **Validity**

Validity refers to the capacity of the measurement tools used in the research to produce appropriate and accurate results (Yıldırım ve Şimşek,

2021). The following steps were followed to ensure the validity of the interview questions:

- **Content Validity:** The interview questions were directly related to the main aims and sub-problems of the research. Expert opinion was sought to ensure that the questions focused on digital tools, game design and the role of these processes in education. An experienced educational scientist evaluated the suitability of the questions for the purpose of the research (Başkale, 2016).
- **Language Validity:** Care was taken to prepare the questions in a clear, understandable and appropriate language for the knowledge level of the participants. In this process, feedback was received from experts and necessary revisions were made to minimise language and meaning errors (Creswell, 2017).
- **Reliability:** Reliability refers to the ability of measurement tools to produce consistent and reproducible results (Başkale, 2016). The following methods were applied to increase the reliability of the interview questions:
- **Coding Reliability:** In the analysis of the interview data, coding was performed by two independent researchers and the coding results were compared. The consistency of the analysis process was evaluated by calculating the inter-coder agreement rate (Tutar, 2022). It was observed that the agreement rate for coding reliability was above 80%.
- **Participant Verification (Member Checking):** In order to increase the accuracy of the data obtained during the interview, participants were given the opportunity to review their responses. This method contributed to preventing misunderstandings and data loss (Creswell, 2017).
- **Detailed Protocols:** The steps and questions to be applied during the interview were organised within the framework of a detailed protocol. This protocol ensured that the data collection process was applied to each participant under the same conditions (Yıldırım & Şimşek, 2021).

2.2. Sample

The sample of the study consisted of a total of 10 participants who graduated from various teaching and child development departments. The participants were determined on a voluntary basis and purposive sampling method was used. Purposive sampling method was preferred because it allows

the selection of individuals with characteristics suitable for the purpose of the research (Başkale, 2016; Patton, 2015). The departmental distribution of the participants is as follows:

- 2 Child Development Graduate (pedagogical formation)
- 4 Graduate of Preschool Education
- 4 Classroom Teaching Graduate

2.3. Limitations

The research has the following limitations:

1. The research is limited to child educators (graduates of classroom teaching, preschool teaching and child development graduates who have pedagogical formation) who are trained in digital game design.
2. The number of participants was limited to 10; therefore, the findings are intended to provide in-depth understanding rather than generalisability.
3. The duration of the training was limited to one month and the long term skill acquisition of the participants was not assessed.
4. Only qualitative data collection methods were used in the study and no quantitative evaluation was made.

2.4. Implementation Process of the Study

The training process was planned as a total of eight sessions, each consisting of two-hour sessions, held on weekends for six weeks. The last two weeks of the training programme were dedicated to the participants’ individual game design projects. The training process is presented in detail in Table 1:

Table 1. Weekly Training Schedule

Week	Application
Week 1	Introduction of digital game design and game engines
Week 2	Gaining basic skills on game engines
Week 3	Game design elements: theme, character and mechanics development
Week 4	Programming and applied studies in game design
5-6. Week	Participants individually realise their game designs

2.5. Data Analysis Methods and Techniques

The data collected in the study were analysed by qualitative analysis methods. Content analysis includes the processes of categorising the data systematically, making thematic coding and examining the relationships between these themes (Hatch, 2002; Krippendorff, 2013). The data analysis process includes the following steps:

1. Transcription of participants' interview responses.
2. Categorisation of the data by thematic coding method.
3. Analysing the relationships between the coded themes.
4. Reporting the findings with a descriptive approach.

In the analysis of the research data, the “WORMACH-MAVI” package programme developed by UTKU KARA and his team (Yusuf Furkan ÇİLİNGİR and Ozan Umut KARA) with Python software language was used and the results were verified by comparing them with MAXQDA software. This approach was preferred to increase the reliability and validity of the analyses.

3. Findings

Table-2 Content Analysis Results of Participants' Views on the Use of Digital Tools in Education (Preliminary Interview Question-1)

Tema (Theme)	Kodlar (Codes)	Katılımcı Alıntıları (Participant Quotes)	Katılımcılar (Participants)
Dijital Araçların Eğitime Katkısı (<i>The Contribution of Digital Tools to Education</i>)	Öğrenme kolaylığı, Eğlenceli öğrenme, Görselleştirme (<i>Ease of learning, Fun learning, Visualization</i>)	- Katılımcı 1 (Çocuk Gelişimi) (Participant 1 (Child Development)) : “Dijital araçlar, çocukların öğrenmesini daha eğlenceli ve kolay hale getiriyor.” (<i>"Digital tools make it more fun and easier for children to learn."</i>) - Katılımcı 6 (Sınıf Öğretmenliği) (Participant 6 (Classroom Teaching)) : “Dijital araçlar bilgiyi görsel ve etkileşimli bir şekilde sunduğu için akılda kalıcı oluyor.” (<i>"Digital tools are memorable because they present information in a visual and interactive way."</i>)	Katılımcı 1, Katılımcı 6 (<i>Participant 1, Participant 6</i>)

Etkileşim ve Motivasyon (Interaction and Motivation)	Motivasyon artışı, Aktif katılım (<i>Increased motivation, Active participation</i>)	- Katılımcı 2 (Okul Öncesi Öğretmenliği) (Participant 2 (Preschool Teacher)): “Dijital araçlar eğitimde motivasyonu artırıyor.” (<i>"Digital tools increase motivation in education."</i>) - Katılımcı 10 (Çocuk Gelişimi) (Participant 10 (Child Development)): “Dijital araçlar, çocukların öğrenme sürecine aktif olarak katılmasını sağlıyor.” (<i>"Digital tools enable children to actively participate in the learning process."</i>)	Katılımcı 2, Katılımcı 10 (<i>Participant 2, Participant 10</i>)
Yaratıcılığı Destekleme (Supporting Creativity)	Yaratıcı düşünce, Yeni beceri gelişimi (<i>Creative thinking, New skill development</i>)	- Katılımcı 5 (Okul Öncesi Öğretmenliği) (Participant 5 (Preschool Teacher)): “Dijital araçlar, yaratıcılığı teşvik etmek için çok faydalı.” (<i>"Digital tools are very useful to encourage creativity."</i>) - Katılımcı 7 (Okul Öncesi Öğretmenliği) (Participant 7 (Preschool Teacher Education)): “Çizim yaparken çocukların yaratıcılıklarını geliştirdiklerini fark ettim.” (<i>"I realized that children develop their creativity while drawing."</i>)	Katılımcı 5, Katılımcı 7 (<i>Participant 5, Participant 7</i>)
Eğitimde Teknoloji Kullanımı Sorunları (Problems of Technology Use in Education)	Teknolojik altyapı eksikliği, Ekran süresi kontrolü (<i>Lack of technological infrastructure, Screen time control</i>)	- Katılımcı 1 (Çocuk Gelişimi) (Participant 1 (Child Development)): “Ama bazen teknolojik altyapı sorunlarıyla karşılaşıyoruz.” (<i>"But sometimes we encounter technological infrastructure problems."</i>) - Katılımcı 3 (Sınıf Öğretmenliği) (Participant 3 (Classroom Teaching)): “Dijital araçlar etkili ama çocukların ekran süresini kontrol etmek gerekiyor.” (<i>"Digital tools are effective, but it is necessary to control children's screen time."</i>)	Katılımcı 1, Katılımcı 3 (<i>Participant 1, Participant 3</i>)

Hızlı Geri Bildirim (Fast Feedback)	Anında sonuç, Motivasyon artırma (<i>Instant results, Motivation boost</i>)	- Katılımcı 8 (Sınıf Öğretmenliği) (Participant 8 (Classroom Teaching)) : “Eğitimde dijital araçları genelde test çözmek ve geri bildirim almak için kullandım. Öğrenciler test sonuçlarını hemen görebildiği için bu onların motivasyonunu artırıyordu.” (<i>"I used digital tools in education mostly for solving tests and getting feedback. Since students could see their test results immediately, this increased their motivation."</i>)	Katılımcı 8 (<i>Participant 8</i>)
Somutlaştırma ve Bilgiye Ulaşım (Embodiment and Access to Information)	Soyut kavramların somutlaştırılması (<i>Concretization of abstract concepts</i>)	- Katılımcı 4 (Çocuk Gelişimi) (Participant 4 (Child Development)) : “Dijital araçlar sayesinde soyut kavramları somutlaştırmak mümkün.” (<i>"Thanks to digital tools, it is possible to concretize abstract concepts."</i>) - Katılımcı 9 (Okul Öncesi Öğretmenliği) (Participant 9 (Preschool Education)) : “Dijital araçlar, eğitimi eğlenceli hale getirme konusunda büyük bir avantaj sağlıyor.” (<i>"Digital tools provide a great advantage in making education fun."</i>)	Katılımcı 4, Katılımcı 9 (<i>Participant 4, Participant 9</i>)

Code-Theme Relationship Explanation and Descriptive Interpretation

The findings of the study were evaluated within the framework of six main themes regarding the role of digital tools in education. Participants expressed strong opinions that digital tools facilitate the learning process, make learning fun and visual, and increase the retention of information. This shows the effect of digital tools in enriching learning experiences. In addition, it was stated that digital tools increase students' motivation by increasing their active participation in lessons and that interactive tools such as game-based learning platforms are effective in this regard.

Participants emphasized that digital tools encourage creativity and improve students' problem solving skills. It was stated that these tools that support creativity help students to generate and implement innovative ideas. However, some problems in the use of digital tools were also mentioned. Participants stated that the lack of technological infrastructure and screen time control are important factors limiting the effective use of these tools.

The ability of digital tools to provide instant feedback was mentioned by the participants as one of the important advantages in education. Especially in applications such as test solving, the rapid feedback provided by these tools played a motivating role in terms of evaluating and improving students' learning processes. It was also stated that digital tools offer a great advantage in concretizing abstract concepts. Participants drew attention to the potential of these tools to make complex topics more understandable and to make learning a more enjoyable process.

In addition to the positive effects of digital tools in education, the research results also point to the need to solve the problems that prevent their effective use. In order for digital tools to be used more widely and efficiently in education, there is a need for infrastructure improvements and increased training of teachers on these tools.

Table-3 Content Analysis Results for Participants' Views on Digital Game Design (Preliminary Interview Question-2)

Tema (Theme)	Kodlar (Codes)	Katılımcı Alıntıları (Participant Quotes)	Katılımcılar (Participants)
Deneyim Eksikliği (Lack of Experience)	Oyun tasarımı deneyiminin olmaması (Lack of game design experience)	- Katılımcı 1 (Çocuk Gelişimi) (Participant 1 (Child Development)): "Hayır, dijital oyun tasarımıyla ilgili bir deneyimim olmadı." <i>("No, I have not had any experience in digital game design.")</i> - Katılımcı 6 (Sınıf Öğretmenliği) (Participant 6 (Classroom Teaching)): "Bir oyun tasarlama deneyimim olmadı." <i>("I have not had any experience in designing a game.")</i> - Katılımcı 9 (Okul Öncesi Öğretmenliği) (Participant 9 (Preschool Teaching)): "Hiç oyun tasarlamadım ama bunun çok öğretici bir süreç olduğuna inanıyorum." <i>("I have never designed a game, but I believe it is a very instructive process.")</i>	Katılımcı 1, Katılımcı 6, Katılımcı 9 (Participant 1, Participant 6, Participant 9)

Eğitimde Katkıları (<i>Contributions in Education</i>)	Öğrenmeyi kolaylaştırma, Eğlenceli öğrenme (<i>Facilitating learning, Fun learning</i>)	- Katılımcı 5 (Okul Öncesi Öğretmenliği) (Participant 5 (Preschool Teacher Education)): “Bir sayı bulmaca oyunu yaparak matematik konularını eğlenceli hale getirebiliriz.” (<i>"We can make math subjects fun by making a number puzzle game."</i>) - Katılımcı 10 (Çocuk Gelişimi) (Participant 10 (Child Development)): “Bir hayvanat bahçesi temalı oyun yaparak çocuklara hayvanları tanıtmak eğlenceli olurdu.” (<i>"It would be fun to introduce animals to children by making a zoo-themed game."</i>)	Katılımcı 5, Katılımcı 10 (<i>Participant 5, Participant 10</i>)
Problem Çözme ve Stratejik Düşünme (<i>Problem Solving and Strategic Thinking</i>)	Problem çözme, Stratejik düşünce geliştirme (<i>Problem solving, Strategic thinking</i>)	- Katılımcı 3 (Sınıf Öğretmenliği) (Participant 3 (Classroom Teaching)): “Dijital oyunların problem çözme ve stratejik düşünme becerilerini geliştirdiğine inanıyorum.” (<i>"I believe that digital games improve problem solving and strategic thinking skills."</i>) - Katılımcı 8 (Sınıf Öğretmenliği) (Participant 8 (Classroom Teaching)): “Matematik veya fen gibi zor konuları oyunlaştırarak çocukların daha kolay öğrenmesini sağlayabiliriz.” (<i>"We can make difficult subjects such as mathematics or science easier for children to learn by gamifying them."</i>)	Katılımcı 3, Katılımcı 8 (<i>Participant 3, Participant 8</i>)
Yaratıcılık ve Özel İçerik Tasarımı (<i>Creativity and Custom Content Design</i>)	Yaratıcılığı artırma, Çocuklara özel içerik (<i>Boosting creativity, Children-specific content</i>)	- Katılımcı 4 (Çocuk Gelişimi) (Participant 4 (Child Development)): “Kendi oyunlarımızı tasarlamak, içeriği eğitim hedeflerine uygun hale getirmemizi sağlar.” (<i>"Designing our own games allows us to align the content with the educational objectives."</i>) - Katılımcı 7 (Okul Öncesi Öğretmenliği) (Participant 7 (Preschool Education)): “Çocuklara özel içerikler hazırlamak mümkün olabilir.” (<i>"It may be possible to prepare special content for children."</i>)	Katılımcı 4, Katılımcı 7 (<i>Participant 4, Participant 7</i>)

Zor Konuları Oyunlaştırma (Gamifying Difficult Topics)	Matematik ve fen gibi derslerin oyunlaştırılması (Gamification of subjects such as math and science)	- Katılımcı 8 (Sınıf Öğretmenliği) (Participant 8 (Classroom Teaching)): “Matematik veya fen gibi zor konuları oyunlaştırarak çocukların daha kolay öğrenmesini sağlayabiliriz.” <i>("We can make difficult subjects such as mathematics or science easier for children to learn by gamifying them.")</i> - Katılımcı 5 (Okul Öncesi Öğretmenliği) (Participant 5 (Preschool Teaching)): “Bir sayı bulmaca oyunu yaparak matematik konularını eğlenceli hale getirebiliriz.” <i>("We can make math subjects fun by making a number puzzle game.")</i>	Katılımcı 8, Katılımcı 5 (Participant 8, Participant 5)
Öğrenci Motivasyonu ve Katılım (Student Motivation and Engagement)	Öğrenci motivasyonunu artırma (Increasing student motivation)	- Katılımcı 2 (Okul Öncesi Öğretmenliği) (Participant 2 (Preschool Teacher Education)): “Oyun tasarlamayı öğrenirsem, çocukların günlük konuları eğlenerek öğrenebileceği içerikler geliştirebilirim.” <i>("If I learn how to design games, I can develop content where children can learn daily topics with fun.")</i> - Katılımcı 10 (Çocuk Gelişimi) (Participant 10 (Child Development)): “Dijital oyunlar, çocukların hem bilgiye hem de deneyime dayalı öğrenmelerini destekler.” <i>("Digital games support children's learning based on both knowledge and experience.")</i>	Katılımcı 2, Katılımcı 10 (Participant 2, Participant 10)

Code-Theme Relationship Explanation and Descriptive Interpretation

The findings of the study show that the views on digital game design are evaluated within the framework of six main themes. First of all, it was determined that most of the participants did not have any experience in digital game design. However, this was not considered as an obstacle but as an opportunity for the learning process. The participants stated that game design has a great potential for acquiring new skills and developing their creativity.

Regarding the contributions of digital games in education, the participants emphasized that these tools facilitate learning processes, make them more fun and create interesting learning environments for students. In particular,

there was a strong opinion that gamification of challenging subjects such as mathematics and science allows these subjects to be learned in an easier and more fun way. In terms of developing problem solving and strategic thinking skills, it was stated that digital games play a critical role in both individual and academic development of students.

Participants agreed that game design enhances creativity and allows teachers to create original content. In addition, the potential of digital games to increase student motivation and active participation in lessons was frequently emphasized. Participants stated that game design processes support student-centered approaches and that these processes add an innovative dimension to pedagogical practices.

As a result, it was concluded that digital game design training is an important tool for teachers' professional development and that these processes promote innovative teaching methods by increasing student motivation. These findings provide a basis for understanding the pedagogical potential of digital games in education and using these tools more effectively, as well as a guiding framework for future research.

Table-4 Content Analysis Results for Participants' Views on Digital Game Design Education (Preliminary Interview Question-3)

Tema (Theme)	Kodlar (Codes)	Katılımcı Alıntıları (Participant Quotes)	Katılımcılar (Participants)
Mesleki Gelişim (Professional Development)	Teknoloji kullanma becerisi, Özgüven artışı (Ability to use technology, Increased self- confidence)	- Katılımcı 3 (Sınıf Öğretmenliği) (Participant 3 (Classroom Teaching)): “Oyun tasarımı öğrenmek, teknolojiyi daha bilinçli kullanmayı öğrenmemi sağlar.” ("Learning game design helps me learn to use technology more consciously.") - Katılımcı 6 (Sınıf Öğretmenliği) (Participant 6 (Classroom Teaching)): “Derslerde teknoloji kullanımına dair özgüvenimi artıracaklarını düşünüyorum.” ("I think it will increase my self-confidence in using technology in lessons.")	Katılımcı 3, Katılımcı 6 (Participant 3, Participant 6)

Yaratıcılık ve Yenilikçilik (Creativity and Innovation)	Yaratıcı düşünme, Yeni alan keşfi (Creative thinking, New space exploration)	- Katılımcı 5 (Okul Öncesi Öğretmenliği) (Participant 5 (Preschool Teacher Training)): “Yaratıcı düşünme becerilerimi geliştireceğimi düşünüyorum.” (“I think it will improve my creative thinking skills.”) - Katılımcı 7 (Okul Öncesi Öğretmenliği) (Participant 7 (Preschool Teaching)): “Bu alanı öğrenerek günlük ders rutinlerini eğlenceli bir şekilde değiştirme şansım olur.” (“By learning this field, I will have the chance to change daily lesson routines in a fun way.”)	Katılımcı 5, Katılımcı 7 (Participant 5, Participant 7)
Öğrenci Motivasyonu ve Katılım (Student Motivation and Engagement)	Dersleri eğlenceli hale getirme (Making lessons fun)	- Katılımcı 1 (Çocuk Gelişimi) (Participant 1 (Child Development)): “Bir dil öğrenme oyunuyla hem eğlenceli hem de eğitici içerikler oluşturabilirim.” (“I can create both fun and educational content with a language learning game.”) - Katılımcı 9 (Okul Öncesi Öğretmenliği) (Participant 9 (Preschool Education)): “Renkler ve sayılarla ilgili bir oyun tasarlayarak hem eğlenip hem öğrenmelerine katkıda bulunabilirim.” (I): “I can contribute to both fun and learning by designing a game about colors and numbers.”)	Katılımcı 1, Katılımcı 9 (Participant 1, Participant 9)
Zor Konuları Oyunlaştırma (Gamifying Difficult Topics)	Matematik, tarih, fen gibi dersleri oyunlaştırma (Gamification of subjects such as mathematics, history, science)	- Katılımcı 8 (Sınıf Öğretmenliği) (Participant 8 (Classroom Teaching)): “Tarih derslerinde geçmiş olayları oyunlaştırarak çocukların daha kolay öğrenmesini sağlayabilirim.” (“I can make it easier for children to learn by gamifying past events in history lessons.”) - Katılımcı 6 (Sınıf Öğretmenliği) (Participant 6 (Classroom Teaching)): “Bir matematik oyunu tasarlayarak çocukların problem çözme becerilerini geliştirmeye yardımcı olabilirim.” (“I can help improve children's problem solving skills by designing a math game.”)	Katılımcı 8, Katılımcı 6 (Participant 8, Participant 6)

Eğitimi Daha Etkili Hale Getirme (Making Education More Effective)	Ders içeriklerini uyarlama, Daha etkili öğretim (Adapting course content, More effective teaching)	- Katılımcı 2 (Okul Öncesi Öğretmenliği) (Participant 2 (Preschool Teacher Education)): “Oyun tasarımı eğitimi, ders içeriklerini çocuklara uygun şekilde uyarlayabilmemi sağlar.” <i>("Game design training enables me to adapt the course content to suit children.")</i> - Katılımcı 4 (Çocuk Gelişimi) (Participant 4 (Child Development)): “Dijital araçları daha etkili bir şekilde kullanmayı öğrenebilirim.” <i>("I can learn to use digital tools more effectively.")</i>	Katılımcı 2, Katılımcı 4 (Participant 2, Participant 4)
Mesleki Tatmin ve Gelişim (Professional Satisfaction and Development)	Öğretim yöntemlerini geliştirme, Tatmin artışı (Improving teaching methods, Increased satisfaction)	- Katılımcı 10 (Çocuk Gelişimi) (Participant 10 (Child Development)): “Bu sürecin, öğretim yöntemlerimi geliştirmek açısından çok faydalı olacağını düşünüyorum. Çocuklara hayvanlar ve doğa temalı bir oyun tasarlayarak öğrenme süreçlerine renk katabilirim.” <i>("I think this process will be very useful in terms of improving my teaching methods. I can add color to children's learning processes by designing a game themed around animals and nature.")</i>	Katılımcı 10 (Participant 10)

Code-Theme Relationship Explanation and Descriptive Interpretation

The research findings reveal that digital game design training offers multifaceted contributions in terms of teachers’ professional development, creativity, increasing student motivation and making education more effective. Participants stated that this training improved their ability to use technology and increased their professional self-confidence in this process. The ability to apply technology-based teaching processes more consciously enabled teachers to use digital tools more effectively in their classrooms. This was considered as an important contribution in terms of managing teaching processes more efficiently and developing innovative practices.

Participants emphasized that the digital game design process encouraged creative thinking skills and enabled lessons to be presented in fun and innovative ways. In particular, this process increased teachers’ motivation to present more original and interesting content to students and made learning more fun by changing the routine structure of lessons. In addition, it was observed that game design increased student motivation, enabled active participation in lessons and enabled the development of content that would be of particular interest to children.

Participants stated that gamification of abstract or challenging courses such as mathematics, science and history through digital game design helped students to understand these courses more easily. This type of gamification was considered as an effective method, especially in terms of developing problem-solving skills and facilitating the learning process. The contributions of digital game design in terms of adapting course content to student needs and making education more effective supported student-centered approaches in pedagogical practices.

Finally, participants reported that the digital game design training increased their professional satisfaction in improving their teaching methods and adopting innovative practices. The contributions of the training process to teachers' professional development had a positive impact on their long-term professional skills. Overall, these findings suggest that digital game design training provides a multifaceted transformation in teachers' professional and pedagogical skills.

Table-5 Content Analysis Results for Participants' Views After the Training Process (Final Interview Question-1)

Tema (Theme)	Kodlar (Codes)	Katılımcı Alıntıları (Participant Quotes)	Katılımcılar (Participants)
Bilgi ve Beceride Artış (Increase in Knowledge and Skills)	Oyun tasarımı becerisi, İçerik oluşturma (Game design skills, Content creation)	- Katılımcı 3 (Sınıf Öğretmenliği) (Participant 3 (Classroom Teaching)): "Şimdi, temel düzeyde bir oyun yapmayı ve bunu nasıl eğitime uyarlayabileceğimi biliyorum." (<i>"Now I know how to make a game at a basic level and how to adapt it to education."</i>) - Katılımcı 4 (Çocuk Gelişimi) (Participant 4 (Child Development)): "Kendi içeriklerimi oluşturabilecek bilgi ve beceriye sahibim." (<i>"I have the knowledge and skills to create my own content."</i>)	Katılımcı 3, Katılımcı 4 (Participant 3, Participant 4)

Öğrenci Motivasyonunu Artırma <i>(Increasing Student Motivation)</i>	Oyunlarla öğrenme motivasyonu <i>(Motivation to learn with games)</i>	- Katılımcı 6 (Sınıf Öğretmenliği) (Participant 6 (Classroom Teaching)): “Tarih konularında kullanılabilecek bir hikâye anlatımı oyunu geliştirdim ve bu, çocukların öğrenme motivasyonunu artırdı.” <i>("I developed a storytelling game that can be used in history subjects and this increased children's motivation to learn.")</i> - Katılımcı 8 (Sınıf Öğretmenliği) (Participant 8 (Classroom Teaching)): “Matematik dersleri için bir sayı bulmaca oyunu yaptım ve bu, öğrencilerin derse olan ilgisini artırdı.” <i>("I made a number puzzle game for math lessons and this increased students' interest in the lesson.")</i>	Katılımcı 6, Katılımcı 8 <i>(Participant 6, Participant 8)</i>
Yaratıcılık ve Yenilikçilik <i>(Creativity and Innovation)</i>	Yaratıcı oyunlar geliştirme <i>(Developing creative games)</i>	- Katılımcı 5 (Okul Öncesi Öğretmenliği) (Participant 5 (Preschool Teaching)): “Kendi müzik temalı bir oyun tasarladım ve çocukların ritim duygularını geliştirdim.” <i>("I designed a music-themed game and developed children's sense of rhythm.")</i> - Katılımcı 10 (Çocuk Gelişimi) (Participant 10 (Child Development)): “Hayvan temalı bir hafıza oyunu yaptım ve bu, çocukların ilgisini çekti.” <i>("I made an animal-themed memory game and it attracted the children's attention.")</i>	Katılımcı 5, Katılımcı 10 <i>(Participant 5, Participant 10)</i>
Dijital Araçlara Güvenin Artışı <i>(Increased Reliance on Digital Tools)</i>	Teknoloji kullanımına güven kazanma <i>(Gaining confidence in the use of technology)</i>	- Katılımcı 1 (Çocuk Gelişimi) (Participant 1 (Child Development)): “Eğitimde teknoloji kullanımına olan güvenimi artırdı.” <i>("It increased my confidence in the use of technology in education.")</i> - Katılımcı 6 (Sınıf Öğretmenliği) (Participant 6 (Classroom Teaching)): “Kendime olan güvenim arttı.” <i>("My confidence in myself increased.")</i>	Katılımcı 1, Katılımcı 6 <i>(Participant 1, Participant 6)</i>

Eğitim Süreçlerini Destekleme (Supporting Education Processes)	Eğitim içeriklerini uyarlama (<i>Adapt training content</i>)	- Katılımcı 2 (Okul Öncesi Öğretmenliği) (Participant 2 (Preschool Teacher)): “Eğitici bir hafıza oyunu tasarlamayı başardım ve bu, mesleki açıdan beni daha yaratıcı hissettirdi.” (<i>"I managed to design an educational memory game and this made me feel more creative professionally."</i>) - Katılımcı 7 (Okul Öncesi Öğretmenliği) (Participant 7 (Preschool Teacher Education)): “Bir eşleştirme oyunu tasarladım ve bunu sınıfta kullandım.” (<i>"I designed a matching game and used it in the classroom."</i>)	Katılımcı 2, Katılımcı 7 (<i>Participant 2, Participant 7</i>)
Öğrenmeyi Eğlenceli Hale Getirme (Making Learning Fun)	Oyun tabanlı öğrenme (<i>Game-based learning</i>)	- Katılımcı 9 (Okul Öncesi Öğretmenliği) (Participant 9 (Preschool Teacher Education)): “İngilizce kelime öğrenimini destekleyen bir oyun tasarladım.” (<i>"I designed a game that supports English vocabulary learning."</i>) - Katılımcı 10 (Çocuk Gelişimi) (Participant 10 (Child Development)): “Dijital araçların çocukların öğrenim süreçlerinde çok yönlü fayda sağlayabileceğini gördüm.” (<i>"I realized that digital tools can provide versatile benefits in children's learning processes."</i>)	Katılımcı 9, Katılımcı 10 (<i>Participant 9, Participant 10</i>)

Code-Theme Relationship Explanation and Descriptive Interpretation

The results of the study show that the digital game design training had multifaceted and in-depth effects on the participants. First of all, the increase in knowledge and skills is remarkable. The participants gained both technical knowledge and pedagogical skills through the digital game design processes and became able to use these skills effectively in their educational content. This process increased the participants' awareness of digital technologies and made them conscious users. In addition, understanding the pedagogical potential of digital tools gave the participants a new perspective on creating original and creative content.

In terms of motivation and interaction, it was observed that digital tools make learning processes more interesting and increase student engagement. Participants stated that game-based learning applications were effective in increasing students' motivation and emphasized that the interactive nature

of these tools significantly increased interest in the lessons. In addition, the contribution of these tools to active learning processes in the classroom increased the efficiency of teaching methods.

The development in creativity and innovative practices stood out as one of the most important achievements of digital game design education. Participants had the opportunity to reveal more of their own creativity in this process and made their course content more innovative. This situation enabled teachers to develop original materials that would attract students' attention and enabled them to adopt different approaches in their educational processes.

Increased confidence in digital tools was another positive outcome of the training process. As the participants improved their skills in using digital tools, they gained self-confidence that they could use these tools more effectively. This self-confidence facilitated the integration of digital technologies into educational processes and led to the formation of positive attitudes towards these tools. Moreover, the supportive role of these tools in pedagogical processes led to a significant improvement in the development and implementation of authentic content.

Finally, it was clearly seen that digital game design makes learning processes more enjoyable. Participants stated that these tools enrich students' learning experiences and make learning a more enjoyable activity. This not only increased students' interest in the lessons, but also made the educational processes more dynamic and interactive. Overall, these findings suggest that digital game design training has led to a significant transformation in both teachers' professional skills and pedagogical approaches.

Table-6 Content Analysis Results of Participants' Opinions After Participating in the Digital Game Design Process (Final Interview Question-2)

Tema (Theme)	Kodlar (Codes)	Katılımcı Alıntıları (Participant Quotes)	Katılımcılar (Participants)
Yaratıcılık ve Yenilikçilik (Creativity and Innovation)	Ders içeriklerini yaratıcı hale getirme (Making course content creative)	- Katılımcı 1 (Çocuk Gelişimi) (Participant 1 (Child Development)): "Bu süreç, ders içeriklerini daha yaratıcı hale getirmem için bana yeni bir perspektif kazandı." ("This process gave me a new perspective to make the course contents more creative.") - Katılımcı 5 (Okul Öncesi Öğretmenliği) (Participant 5 (Preschool Education)): "Dijital oyun tasarımı, ders planlamada daha yaratıcı olmamı sağladı." ("Digital game design helped me to be more creative in lesson planning.")	Katılımcı 1, Katılımcı 5 (Participant 1, Participant 5)
Öğrenci Motivasyonu ve Katılım (Student Motivation and Engagement)	Öğrenmeyi eğlenceli hale getirme (Making learning fun)	- Katılımcı 2 (Okul Öncesi Öğretmenliği) (Participant 2 (Preschool Teacher Education)): "Dersleri daha eğlenceli ve etkileşimli hale getirme konusunda bana ilham verdi." ("It inspired me to make the lessons more fun and interactive.") - Katılımcı 9 (Okul Öncesi Öğretmenliği) (Participant 9 (Preschool Teaching)): "Dil öğrenimini daha eğlenceli hale getirdim." ("I made language learning more fun.")	Katılımcı 2, Katılımcı 9 (Participant 2, Participant 9)
Mesleki Özgüven ve Donanım (Professional Self-confidence and Equipment)	Teknoloji kullanımı özgüveni (Confidence in technology use)	- Katılımcı 3 (Sınıf Öğretmenliği) (Participant 3 (Classroom Teaching)): "Daha önce teknoloji kullanımı konusunda kendimi yetersiz hissediyordum, ancak bu eğitim sayesinde teknolojiyi derslerime nasıl entegre edebileceğimi öğrendim." ("I felt inadequate in using technology before, but thanks to this training, I learned how to integrate technology into my lessons.") - Katılımcı 10 (Çocuk Gelişimi) (Participant 10 (Child Development)): "Mesleki olarak artık daha donanımlı hissediyorum." ("I feel more equipped professionally now.")	Katılımcı 3, Katılımcı 10 (Participant 3, Participant 10)

Öğretim Yöntemlerinin Zenginleşmesi (<i>Enrichment of Teaching Methods</i>)	Eğitim yöntemlerini geliştirme (<i>Improving training methods</i>)	- Katılımcı 6 (Sınıf Öğretmenliği) (<i>Participant 6 (Classroom Teaching)</i>): “Tarih derslerinde olayları oyunlaştırmayı planlıyorum.” (<i>"I plan to gamify events in history lessons."</i>) - Katılımcı 8 (Sınıf Öğretmenliği) (<i>Participant 8 (Classroom Teaching)</i>): “Öğretim yöntemlerimi zenginleştirdi.” (<i>"It enriched my teaching methods."</i>)	Katılımcı 6, Katılımcı 8 (<i>Participant 6, Participant 8</i>)
Öğrenci Odaklı Yaklaşım (<i>Student Focused Approach</i>)	Çocuklara yönelik özel içerik oluşturma (<i>Creating specialized content for children</i>)	- Katılımcı 4 (Çocuk Gelişimi) (<i>Participant 4 (Child Development)</i>): “Çocukların duygularını anlamalarını destekleyen bir oyun tasarladım.” (<i>"I designed a game that supports children to understand their emotions."</i>) - Katılımcı 7 (Okul Öncesi Öğretmenliği) (<i>Participant 7 (Preschool Education)</i>): “Şekilleri öğrenmek için bir eşleştirme oyunu tasarladım.” (<i>"I designed a matching game for learning shapes."</i>)	Katılımcı 4, Katılımcı 7 (<i>Participant 4, Participant 7</i>)
Mesleki Tatmin ve Motivasyon (<i>Occupational Satisfaction and Motivation</i>)	Mesleki tatmin artışı, Teknoloji adaptasyonu (<i>Increased professional satisfaction, Technology adaptation</i>)	- Katılımcı 5 (Okul Öncesi Öğretmenliği) (<i>Participant 5 (Preschool Teaching)</i>): “Bu süreç, mesleki gelişimimde çok önemli bir adım oldu.” (<i>"This process was a very important step in my professional development."</i>) - Katılımcı 9 (Okul Öncesi Öğretmenliği) (<i>Participant 9 (Preschool Teaching)</i>): “Bu tür bir öğrenme yöntemi öğretmenliğime değer kattı.” (<i>"This kind of learning method added value to my teaching."</i>)	Katılımcı 5, Katılımcı 9 (<i>Participant 5, Participant 9</i>)

Code-Theme Relationship Explanation and Descriptive Interpretation

The findings of the study reveal that digital game design education made significant contributions to the professional and pedagogical development of the participants. First, the theme of **creativity and innovation** stands out. The participants stated that the digital game design process gave them the ability to prepare course content in a more creative and innovative way. This made the lessons more interesting and encouraged the adoption of innovative methods in teaching practices. The flexibility offered by digital tools enabled

teachers to develop original and innovative materials by gamifying different course contents.

In terms of **student motivation and engagement**, it was observed that digital games make learning more fun and interactive. Participants reported that these tools increased students' active participation in learning processes and strengthened their motivation to learn. Game-based learning was particularly effective in increasing interest in the lessons and enabled students to be actively involved in the lessons.

Another important outcome of the training process emerged under the theme of **professional self-confidence and equipment**. Participants improved their skills in using digital tools and felt more professionally equipped as a result of this process. This increase in self-confidence facilitated the integration of digital tools into classroom practices and contributed to teachers' positive attitudes towards digital technologies.

The enrichment of teaching methods is another important contribution of digital game design to pedagogical processes. The participants created gamification-based educational contents by using digital tools effectively and observed the effect of these contents in the lessons. This process diversified the teaching methods and contributed to making the lessons more effective, efficient and student-oriented.

Finally, the theme of **professional satisfaction and motivation** shows that digital game design training increased teachers' satisfaction with their jobs. Participants stated that they had the opportunity to both improve their professional skills and add an innovative dimension to their learning processes. This strengthened teachers' motivation and commitment to their jobs.

In general, digital game design training allowed teachers to develop both technical and pedagogical skills, enabled them to adopt creative and innovative approaches, and made their educational processes more effective and engaging. The research results show that such trainings provide an important basis for better understanding the potential of digital technologies in education and using these tools more efficiently.

Table-7 Participants' Views on the Integration of Skills into Educational Processes after Digital Game Design Training (Final Interview Question-3)

Tema (Theme)	Kodlar (Codes)	Katılımcı Alıntıları (Participant Quotes)	Katılımcılar (Participants)
Ders İçeriklerini Zenginleştirme (Enriching Course Content)	Eğitici oyunlar tasarlama, Oyunları çeşitlendirme (Emotional Development and Empathy)	- Katılımcı 1 (Çocuk Gelişimi) (Participant 1 (Child Development)): “Her ders için farklı oyunlar geliştirerek öğrenmeyi daha eğlenceli hale getirmek istiyorum.” <i>("I want to make learning more fun by developing different games for each lesson.")</i> - Katılımcı 3 (Sınıf Öğretmenliği) (Participant 3 (Classroom Teaching)): “Matematik derslerine entegre edeceğim.” <i>("I will integrate it into math lessons.")</i>	Katılımcı 1, Katılımcı 3 (Participant 1, Participant 3)
Kavramsal Öğrenme (Conceptual Learning)	Şekil, renk ve dil öğrenimi (Shape, color and language learning)	- Katılımcı 7 (Okul Öncesi Öğretmenliği) (Participant 7 (Preschool Teacher)): “Şekil ve renk konularında eşleştirme oyunları oynatarak öğrenmeyi destekleyeceğim.” <i>("I will support learning by playing matching games on shape and color.")</i> - Katılımcı 9 (Okul Öncesi Öğretmenliği) (Participant 9 (Preschool Teaching)): “İngilizce kelime öğrenimi için oyun hazırladım.” <i>("I prepared games for English vocabulary learning.")</i>	Katılımcı 7, Katılımcı 9 (Participant 7, Participant 9)
Sosyal Becerileri Destekleme (Supporting Social Skills)	Grup çalışmaları, İş birliği (Group work, Collaboration)	- Katılımcı 5 (Okul Öncesi Öğretmenliği) (Participant 5 (Preschool Teacher)): “Çocukların sosyal becerilerini geliştirecek grup oyunları oluşturmayı düşünüyorum.” <i>("I am thinking of creating group games that will improve children's social skills.")</i> - Katılımcı 10 (Çocuk Gelişimi) (Participant 10 (Child Development)): “Çocukların hem eğlenmesi hem öğrenmesi için oyunları entegre edeceğim.” <i>("I will integrate games for children to have fun and learn.")</i>	Katılımcı 5, Katılımcı 10 (Participant 5, Participant 10)

Tarihi ve Soyut Konuları Somutlaştırma (Concretizing Historical and Abstract Subjects)	Tarihi olayları oyunlaştırma, Eğitici hikayeler (Gamification of historical events, Educational stories)	- Katılımcı 6 (Sınıf Öğretmenliği) (Participant 6 (Classroom Teaching)) : “Tarih derslerinde hikayeleri oyunlaştırarak çocukların tarihi olayları daha iyi anlamalarını sağlayacağım.” (<i>"I will help children understand historical events better by gamifying stories in history lessons."</i>)	Katılımcı 6 (Participant 6)
Motivasyon ve Eğlence Odaklı Yaklaşım (Motivation and Fun Focused Approach)	Eğlenceli öğrenme, Motivasyonu artırma (Fun learning, Increasing motivation)	- Katılımcı 2 (Okul Öncesi Öğretmenliği) (Participant 2 (Preschool Teacher)) : “Mevsimler temalı bir oyun oynatarak bilgilerini pekiştirmelerini sağlayacağım.” (<i>"I will help them reinforce their knowledge by playing a game with the theme of seasons."</i>) - Katılımcı 8 (Sınıf Öğretmenliği) (Participant 8 (Classroom Teaching)) : “Tasarladığım oyunlar sayesinde öğrenme sürecini hızlandırmayı amaçlıyorum.” (<i>"I aim to accelerate the learning process through the games I design."</i>)	Katılımcı 2, Katılımcı 8 (Participant 2, Participant 8)
Duygusal Gelişim ve Empati (Emotional Development and Empathy)	Duyguları anlama, Empati geliştirme (Understanding emotions, developing empathy)	- Katılımcı 4 (Çocuk Gelişimi) (Participant 4 (Child Development)) : “Çocukların duygusal gelişimini destekleyen bir oyun tasarladım ve bu oyunu sınıf içi etkinliklere entegre etmeyi planlıyorum.” (<i>"I designed a game that supports children's emotional development and I plan to integrate this game into classroom activities."</i>)	Katılımcı 4 (Participant 4)

Code-Theme Relationship Explanation and Descriptive Interpretation

Digital game design training brought about significant changes in the development of teachers' pedagogical skills and their capacity to use technology effectively in classroom practices. Under the theme of **enriching course content**, participants stated that they made learning processes more interesting and effective by integrating digital games into different courses. This approach led to a diversification of instructional materials and allowed for innovative ways of presenting lessons.

Conceptual learning has shown how digital games are an effective tool for teaching basic concepts in early childhood. Abstract concepts such as

shape, color and language learning became concrete through gamification, which increased children's interest in the learning process. Furthermore, the theme **Supporting social skills** revealed that group work and cooperative games strengthened communication and cooperation skills among children.

Making abstract and complex course contents such as history and science more accessible by making them concrete through gamification was discussed under the theme of **concretizing historical and abstract subjects**. Participants emphasized that this approach facilitated students' learning process and increased their interest in abstract concepts. In addition, the theme of **motivation and entertainment-oriented approach** emphasized that the fun structure of digital games increases students' motivation and strengthens their participation in learning.

The theme of **emotional development and empathy** revealed that digital games are effective in achieving not only cognitive but also emotional learning goals. Participants stated that the games improved students' empathy and emotional intelligence skills.

Up to this point in the section on the findings of the research, the analysis and interpretation of the data obtained after the pre- and post-interviews have been emphasized. Within the framework of the findings and interpretations, 2 more important facts will be emphasized: **I. Comparison of pre- and post-interview data; II. Interpretation of the findings based on the research question and sub-questions**

I. Comparison of Pre and Post Interview Data

In the study, although there was a general awareness that digital tools would contribute to education before the training process, it was observed that the participants lacked knowledge on how to use these tools. After the training, the participants learned digital game design and gamification processes, were able to develop content suitable for students, and were able to use their creativity more effectively in this process. In addition, at the end of the training process, teachers' reservations about learning the technical aspects of digital tools were replaced by self-confidence, which enabled them to manage pedagogical processes more effectively.

Participants expressed the motivation-enhancing effect of digital tools as a general assumption in the pre-tests, but they did not know how to realize this in practice. After the training, it was stated with concrete examples that digital games, with their interactive structure, provide active participation in students' learning processes and increase motivation. For example, the

gamification of stories in history lessons increased students' interest in historical events.

Another contribution of the training process was the encouragement of creative thinking and the development of innovative content. The deficiencies experienced in these areas before the training were significantly overcome after the training process and the participants became more effective in producing original materials. Making difficult subjects such as mathematics or science fun by gamifying them made abstract concepts concrete and increased students' interest in these subjects.

In terms of professional self-confidence and satisfaction, concerns about how to use digital tools in classroom practices decreased after the training and were replaced by a more positive approach. The participants increased their professional satisfaction thanks to the digital game design training and stated that this process made a significant contribution to pedagogical practices.

In this context, the results of the study show that digital game design training is an effective tool in developing both technical and pedagogical skills of teachers. At the end of the training process, participants were able to apply student-centered approaches more effectively, produce creative and innovative content, and better understand the potential of digital technologies in education and use these tools efficiently. These findings reveal that digital game design is a powerful tool for making educational processes more effective, fun and interactive.

II. Interpretation of Findings Based on Research Question and Sub-questions

The findings obtained in line with the problem and sub-problem questions of the study reveal that participation in digital game design processes significantly affects the attitudes and skills of child educators towards digital tools. At the beginning of the study, it was observed that the participants lacked experience in digital game design and generally evaluated the role of digital tools in education in a positive framework, but they were inadequate in terms of how to integrate these tools into pedagogical practices. Although the participants were aware of the potential advantages of digital tools such as facilitating learning, increasing interaction and supporting motivation, they lacked the knowledge and skills to use these advantages effectively in the classroom. In response to the first sub-problem question of the study,

this shows that attitudes towards digital tools are generally positive, but the ability to use these tools pedagogically effectively is lacking.

After the training process, it was determined that the digital game design training provided a significant improvement in the knowledge and skills of the participants and that this improvement could be used effectively in classroom practices. The digital game design process encouraged the participants' creativity, increased their professional self-confidence and provided them with concrete gains in the pedagogical integration of technological tools. Participants reported that gamified content increased students' motivation to learn and made challenging subjects more understandable and enjoyable. For example, gamification of abstract and complex subjects such as history, science and mathematics increased students' interest and engagement in these subjects. In response to the second sub-problem question, these findings suggest that digital game design training has the potential to improve educators' skills and transform these skills into classroom practices.

The research process also revealed that game design using digital game engines contributed to the child educators' better understanding of the pedagogical potential of digital tools. The participants observed that the games they designed supported not only cognitive development but also emotional and social development, and in the process increased their awareness of student-centered approaches. The most emphasized contributions of digital games were that they encourage creativity, make the learning process fun and provide the opportunity to deliver individualized content. At the end of the training process, it was seen that the participants' self-confidence towards digital tools increased and their perceptions that they could use these tools effectively in their teaching processes were strengthened. These findings, in response to the third sub-problem question, reveal that the digital game design process played an important role in understanding the pedagogical potential and that the participants gained the ability to use technology more consciously and effectively in this process.

In conclusion, digital game design training positively changed the attitudes and skills of child educators towards digital tools, enabled them to use technology innovatively in pedagogical processes, and contributed to their professional development in many ways. The research findings suggest that this type of training is an effective method that supports both individual and pedagogical gains.

4. Conclusion

This study examined the effects of digital game design training on pedagogical knowledge, skills and attitudes of child educators (classroom teachers, pre-school teachers and child development graduates with pedagogical formation). The findings of the research show that digital tools and game design processes provide significant contributions in terms of enriching educational processes and increasing students' learning motivation.

- **Digital Game Design and Pedagogical Gains:** Participants stated that they gained the ability to use game engines and digital tools more consciously after digital game design training. In this process, the potential to make course content creative and interesting came to the fore; it was emphasised that the concretisation of abstract courses such as mathematics, science and history by gamification is an effective teaching method.
- **Student Motivation and Interaction:** Digital game design increased student motivation and made the lessons more fun and interactive. Participants stated that game-based learning supported students' active participation in the lesson and made learning processes more efficient.
- **Professional Confidence and Satisfaction:** While the lack of knowledge and experience in using digital tools was a factor that limited the professional self-confidence of the participants before the training, it was observed that this self-confidence increased and professional satisfaction was strengthened after the training. The participants stated that this process improved them in using technology more effectively in classroom practices.
- **Creativity and Innovation:** The training process supported teachers' creative thinking skills and enabled them to enrich their course content with innovative methods. Participants enriched students' learning experiences by designing original and educational games.
- **Emotional and Social Development:** Digital games have the potential to develop not only cognitive but also emotional and social skills. Participants stated that game-based learning contributes to skills such as empathy and emotional awareness.

5. Discussion

The research findings show that digital game design education leads to significant improvements in the pedagogical knowledge and skills of pre-service teachers and graduates. The findings are in line with previous studies in the literature and support research emphasising the effects of digital games in education:

- **Development of 21st Century Skills:** Digital game design enables the development of 21st century skills such as problem solving, critical thinking, creativity and collaboration (Gee, 2008; Squire, 2011). The findings obtained in this study reveal that digital game design is an effective tool for integrating these skills into educational processes.
- **Motivation and Interaction:** The effect of digital games on increasing student motivation is a frequently emphasised issue in the literature (Boyle et al., 2014; Connolly et al., 2012). In this study, the participants stated that they increased students' interest in the lesson through game design, and this was in line with the findings in the literature.
- **Enriching Teaching Methods:** Digital game design training enabled participants to diversify their teaching methods and enrich their course content. This result supports the role of digital tools in the adoption of innovative approaches in education (Dondlinger, 2007).
- **Emotional and Social Learning:** Game-based learning draws attention with its potential to contribute to emotional skills such as empathy and emotional awareness (Jenkins et al., 2019). The research findings supported similar studies in the literature by revealing that digital games contribute to the development of such skills.
- **Limitations and Future Research:** The limitations of the study include the difficulty of generalising the sample size and focusing only on qualitative data collection methods. Future studies can be conducted with larger sample groups and supported by quantitative methods to examine the contributions of digital game design to education more comprehensively.

As a result, digital game design training is considered as an important tool for improving teachers' professional skills, increasing student motivation and supporting innovative teaching methods.

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CHAPTER 6

A NEW PARADIGM IN EDUCATION: TECHNOLOGY

Büşra DURSUN¹

Introduction

The digital transformation in education is occurring at an unprecedented pace, driven by the technological advancements of our era (Raja & Nagasubramani, 2018). Digital tools and platforms have enabled innovative practices in teaching and learning processes, offering new approaches, especially in remote education. In this context, teachers' adaptation to technology and their ability to communicate effectively with students play a critical role in the digitalization of education systems (Ronzhina et al., 2021).

This study evaluates the impact of digital technologies on education from a teacher's perspective and examines creative examples of technology usage. Specifically, the application of simulations to address interdisciplinary topics such as environmental awareness and climate change is presented as an innovative approach that enriches the learning experience (WWF-UK, 2023; University of Waterloo Climate Institute, 2025).

¹ Bahçeşehir College Kocaeli Campuss, High School Department, Kocaeli, Turkey²
ORCID Code: 0009-0003-6223-2309, busradursun88@gmail.com

Scientific Background: The Impact of Technology in Education and Teacher Perspectives

The Role of Digitalization in Education

Modern technologies have brought profound changes to educational processes, redefining teaching and learning methods (Haleem et al., 2022). This transformation marks a period where digital tools and platforms have enriched the learning experience. Particularly, the COVID-19 pandemic accelerated the necessity for digital transformation in education, promoting the widespread use of online educational tools (National Education Technology Plan, 2020).

As emphasized in the NETP 2020 report, digitalization holds significant potential, especially in the areas of personalized learning and equitable access. In this regard, education can become more inclusive and sustainable (OECD, 2025).

Teachers' Perspectives on Digital Technology

Teachers generally assess the role of technology in education from two different perspectives:

1. **Positive Approach:** Teachers emphasize that technology enriches teaching materials, facilitates communication and collaboration with students, and makes lessons more interactive and effective (Ghory & Ghafory, 2021).
2. **Concerns and Challenges:** Some teachers experience difficulties adapting to digital tools, viewing this process as an additional burden in their teaching efforts. This challenge is particularly evident for teachers who lack sufficient technology training (Mykolaiko et al., 2022).

The Impact of Technology on Teacher Roles

Technology strengthens teachers' guiding roles while shifting them away from being mere transmitters of knowledge, promoting a student-centered approach (Al-Rahmi et al., 2020). Through digital tools, teachers can:

- Respond more quickly and effectively to the individual learning needs of students (Ghory & Ghafory, 2021).

- Track student achievements via data analytics and learning management systems (LMS) (Spector, 2021).
- Use various e-learning platforms to create personalized learning plans and evaluate students' performance in a customized manner (Al-Rahmi et al., 2020).

Digital Competence and Continuous Professional Development

The successful integration of technology into educational settings requires the development of teachers' digital competencies (Spector, 2021). Research highlights the importance of teachers fostering positive attitudes towards digital tools and participating in continuous professional development programs to use these tools effectively (Mykolaiko et al., 2022).

Educational Technologies for a Sustainable Future

Five key trends emphasize the role of educational technologies in building a sustainable future: artificial intelligence, data analytics, gamification, open-source platforms, and tools focused on environmental awareness (OECD, 2025). These trends hold the potential to offer more innovative and effective educational solutions in the future.

The Use of Simulations in Education

David Crookall's (2013) study, titled "*Climate Change and Simulation/Gaming: Learning for Survival*", highlights the effectiveness of simulations as tools for understanding complex issues. In educational settings, such applications enhance students' strategic thinking and decision-making skills.

Teachers can leverage these tools to help students both gain environmental awareness and develop a deeper understanding of sustainability topics.

Uncertainty and Games

A study by Van Schaik (2023) demonstrates that games are effective tools for teaching uncertain topics such as climate change. In this context, teachers are encouraged to adopt game-based learning methods to foster emotional and cognitive development in students.

Learning Through Computer Games

Research by Smith et al. (2019) reveals how computer games provide an effective method for understanding complex subjects. Particularly, games

that help students comprehend the local impacts of climate change play a significant role in enhancing environmental awareness.

CO₂ Emission Calculation Tools

A study conducted in 2023 underscores the significance of CO₂ emission calculation tools designed to increase students' environmental awareness. These tools, developed in collaboration with a food company in Mexico, evaluate greenhouse gas emissions across categories like energy, industry, transportation, and waste. Such applications provide students with opportunities to develop solutions to real-world sustainability challenges.

Climate Pedagogy in Teacher Training

A study conducted at Lakehead University in Canada focused on enhancing the pedagogical knowledge of teacher candidates regarding climate change education. This 2015 study demonstrated how discussion and hands-on learning activities increased teacher candidates' awareness of climate change. Furthermore, the importance of integrating political content and social contexts into the teaching process was emphasized.

UNESCO's Six Pillars Framework for Digital Transformation in Education

The 2024 UNESCO report identifies six foundational pillars critical for the digital transformation of education systems (UNESCO, 2021). These pillars—connectivity and infrastructure, cost and sustainability, capacity and culture, content and solutions, data and evidence, and coordination and leadership—provide a comprehensive framework for integrating technology into education.

OECD's Trends Shaping Education 2025

The OECD's 2025 report highlights several transformative trends affecting education globally, including the integration of artificial intelligence (AI), sustainability, and the growing importance of mental health and well-being in educational contexts (OECD, 2025).

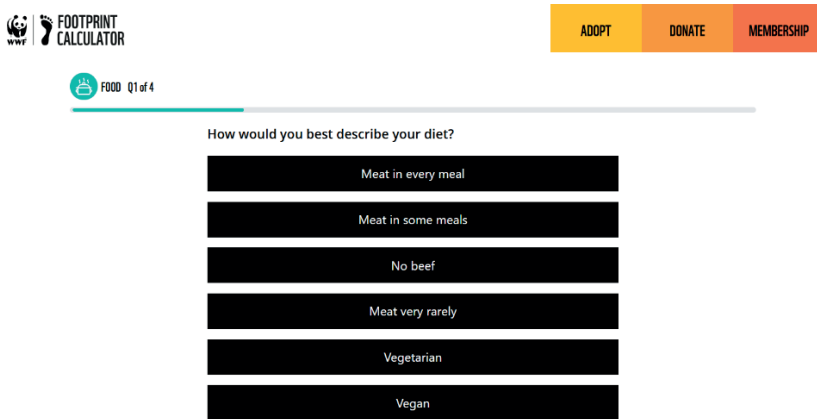
Application of Insights to Current Educational Practices

Building on the foundational work of UNESCO and OECD, this study recommends actionable strategies such as policy development, teacher

training, curricular innovations, and stakeholder collaboration to enhance digital education systems.

WWF Footprint Calculator

The WWF Footprint Calculator is a simulation tool designed to measure the environmental impact of individuals' lifestyles. Users can calculate their carbon footprints based on categories such as energy consumption, transportation habits, and food choices. An analysis conducted by WWF from 2019 to 2022 revealed that this calculator, with data from over one million users, was effective in measuring individual carbon footprints. The average carbon footprint was calculated as 12.26 tCO₂e, which is significantly above the Paris Agreement target of 2.3 tCO₂e (WWF-UK, 2023).



The screenshot shows the WWF Footprint Calculator interface. At the top left is the WWF logo and the text 'FOOTPRINT CALCULATOR'. To the right are three buttons: 'ADOPT' (yellow), 'DONATE' (orange), and 'MEMBERSHIP' (red). Below these is a progress bar with a green segment and the text 'FOOD Q1 of 4'. The main question is 'How would you best describe your diet?'. Below this are six black buttons with white text: 'Meat in every meal', 'Meat in some meals', 'No beef', 'Meat very rarely', 'Vegetarian', and 'Vegan'.

Figure 1. WWF Footprint Calculator interface and personal carbon footprint calculation process.

(This figure displays the WWF Footprint Calculator interface, which allows users to assess their personal environmental impact.)

  FOOTPRINT CALCULATOR

ADOPTDONATEMEMBERSHIP

 FOOD Q2 of 4

In a week, how much do you spend on food from restaurants, canteens and takeaways?

£0

£1 - £10

£10 - £60

More than £60

BACK

NEXT QUESTION

Figure 2. WWF Footprint Calculator: Analysis of national and regional carbon footprint trends.

(This figure illustrates how the WWF Footprint Calculator provides data insights on carbon footprints at national and regional levels.)

  FOOTPRINT CALCULATOR

ADOPTDONATEMEMBERSHIP

 FOOD Q3 of 4

Of the food you buy how much is wasted and thrown away?

None

0% - 10%

10% - 30%

More than 30%

BACK

NEXT QUESTION

Figure 3. WWF Footprint Calculator: Carbon footprint distribution based on lifestyle choices.

(This figure presents a breakdown of carbon footprint components such as energy consumption, transportation habits, and dietary choices.)

Illuminate: Climate Change Simulation Game

Illuminate is an educational simulation game developed through a collaboration between the University of Waterloo's Climate Institute and Games Institute. Players complete two main tasks while exploring solutions to climate change impacts:

1. Investigate ways to reduce greenhouse gas (GHG) emissions.
2. Visit Canada's coastal, rural, and urban communities to prepare these areas for climate change impacts through necessary measures (University of Waterloo Climate Institute, 2025).



Figure 5. Illuminate: Mission 1 Overview: Reducing Greenhouse Gas Emissions to Combat Climate Change. (This figure provides an overview of the first mission, focusing on selecting technologies and strategies to lower global carbon emissions and mitigate climate change.)

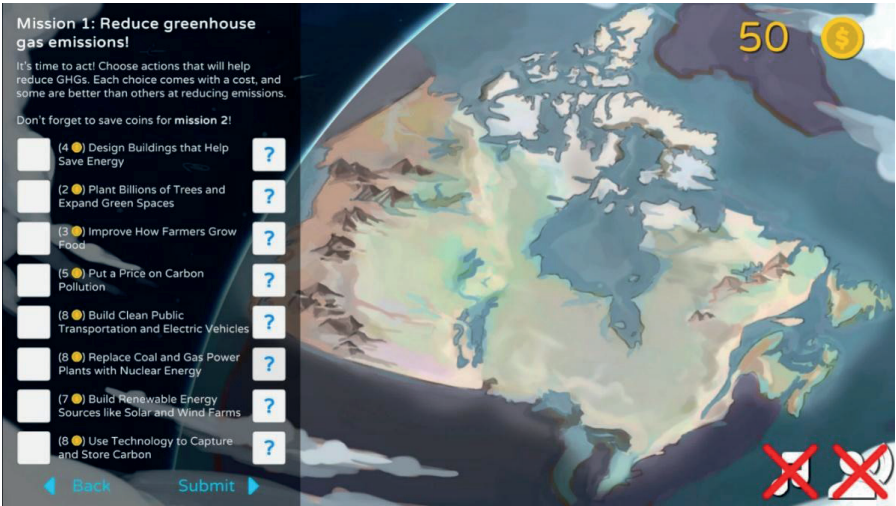


Figure 6. Mission 1: Actions to Reduce Greenhouse Gas Emissions.
(This figure presents options and actions available for reducing greenhouse gas emissions, emphasizing their costs and impacts.)

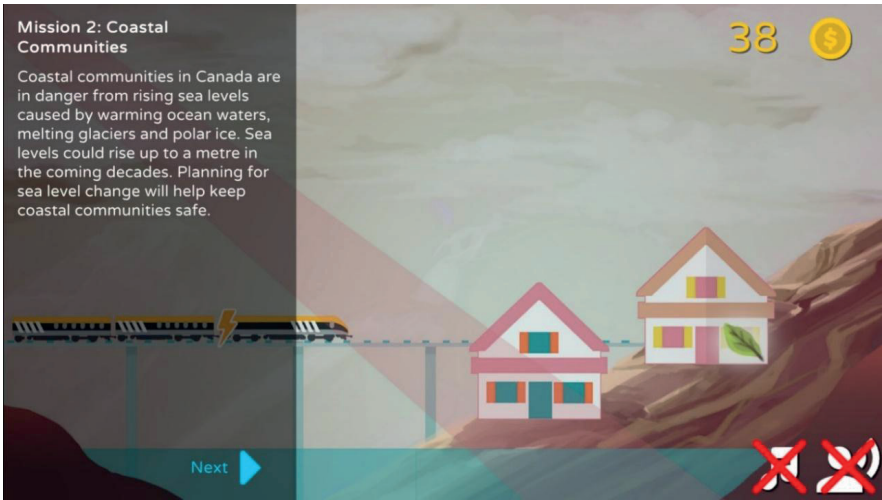


Figure 7. Illuminate: Mission 2: Coastal Communities at Risk from Rising Sea Levels. (This figure illustrates the threats faced by coastal communities in Canada due to rising sea levels caused by climate change, along with a focus on planning for sea level changes.)

Conclusion and Recommendations

The integration of technology into education can enhance the digital competencies of both students and teachers, creating more effective and sustainable learning processes. Based on this study, the following recommendations are proposed:

1. *Promoting the Use of Games and Simulations:*

- o Tools such as the WWF Footprint Calculator and Illuminate Climate Change Simulation Game should be encouraged. These tools help students develop environmental awareness and understand complex environmental issues.
- o Integrating such tools into curricula should not only involve technical applications but also be framed within a pedagogical planning approach.

2. *Improving Teachers' Digital Competencies:*

- o Continuous professional development programs should facilitate teachers' adaptation to digital technologies and enhance their pedagogical approaches.
- o Teachers should be guided on how to effectively utilize innovative technologies such as gamification, augmented reality (AR), and artificial intelligence (AI).

3. *Supporting Sustainable Educational Approaches:*

- o Simulations and games focusing on environmental awareness can improve students' critical thinking and problem-solving skills. These tools should be increasingly used for interdisciplinary topics such as climate change.
- o Sustainability-based projects should be evaluated not only as learning materials but also as tools for raising societal awareness.

4. *Integrating Innovative Technologies into Education:*

- o AI-supported personalized learning platforms should be promoted to address individual student needs more effectively.
- o Learning experiences can be enriched through augmented reality and virtual reality applications.

Future Perspective

This study discusses the impacts of digital technologies on education and provides recommendations for the use of simulations. In the future, the following developments in educational technologies are expected:

- Increased use of technologies such as artificial intelligence, augmented reality, and data analytics in education.
- Strengthened student-centered learning approaches supported by digital tools.
- Development of more simulation- and game-based educational materials to raise environmental awareness.

Enhancing teachers' digital literacy and facilitating access to these technologies will play a crucial role in effectively utilizing technology in education.

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CHAPTER 7

EVALUATION OF SOCIAL STUDIES COURSE IN TERMS OF SUSTAINABLE DEVELOPMENT

Nusret KOCA¹

Mustafa TOKLU²

Introduction

Education is essential for instilling desired behaviors in individuals and transferring accumulated knowledge to future generations. Within this purpose, education is defined as the process through which an individual experiences desired changes in behavior as a result of their experiences. In other words, education can also be seen as a process of helping individuals discover their innate abilities, preparing them for the future by imparting societal norms. In this context, the Social Studies course plays a significant role in equipping individuals with the knowledge, skills, and values necessary to prepare them for social life. Sosyal Bilgiler dersinin de çeşitli tanımları bulunmaktadır. Barr vd. (2013)'ne göre Sosyal Bilgiler beşerî ve sosyal bilimlerin birleşmesinden oluşan ve vatandaşlık eğitimi odak noktasına alan disiplinler arası bir derstir. Bu tanıma göre Sosyal Bilgiler amacı ve yöntemlerdeki farklılıklara rağmen evrensel vatandaşlık normlarına erişmede

1 Prof. Dr. Afyon Kocatepe University, Faculty of Education, Department of Basic Education, Turkey, nkoca@aku.edu.tr, ORCID Code: 0000-0002-1415-9683

2 PhD Student, Afyon Kocatepe University, Faculty of Education, Department of Basic Education, Turkey mustafa.toklu@outlook.com, ORCID Code: 0000-0001-5740-7360

bir araç olarak “vatandaşlık” konusu vurgulanmaktadır. Sosyal Bilgiler ile ilgili en kapsamlı tanımlardan biri de 2005 Sosyal Bilgiler programında belirtilmiştir (Tay, 2013). MEB (2005)’e göre Sosyal Bilgiler; “Bireyin toplumsal anlamda varoluş amacını gerçekleştirme durumuna yardım etmek için; coğrafya, tarih, ekonomi, antropoloji, sosyoloji, psikoloji, felsefe, siyaset bilimi ve hukuk başta olmak üzere farklı sosyal bilimlerin konularını ve yurttaşlık bilgisi konularını içeren; bireylerin sosyal ve fiziki çevreleriyle etkileşiminin geçmiş, bugün ve gelecek zaman bütününde incelendiği; birlikte öğretim durumundan hareketle meydana getirilmiş ilköğretim dersidir.” şeklinde tanımlanmıştır.

Safran (2008) stated that there are four sub-dimensions of Social Studies in the definition mentioned above. He stated that it aims to realize the existence of the individual, includes citizenship and social sciences subjects, reflects the interaction of the individual with his/her social and physical environment and is created in line with the understanding of collective education.

Öztürk (2012) defines Social Studies as “an instructional program that combines knowledge and methodologies from social sciences and humanities to cultivate active citizens capable of making informed decisions and solving problems in an ever-changing national and global context.” Social Studies can also be described as a field of study in primary education that aims to develop conscious and responsible individuals by equipping students with essential knowledge, skills, attitudes, and values related to social life, based on selected information from social science disciplines. One of the most comprehensive definitions of Social Studies was provided by Doğanay (2005): An interdisciplinary field that examines human interaction with physical and social environments across time by utilizing content and methods from social and other human sciences, aiming to cultivate thoughtful and skilled democratic citizens equipped with fundamental democratic values in an increasingly globalized world.

The National Council for the Social Studies (NCSS) defines Social Studies as “an interdisciplinary field of study that synthesizes the humanities and social sciences to cultivate civic values. The primary objective of Social Studies education is to equip individuals with the ability to make informed, rational decisions grounded in knowledge and logic, for the public good, as citizens of a culturally diverse and democratic society within an interconnected world” (Safran, 2008). Tanımlardan yola çıkılacak olunursa; bireylerin günlük yaşam problemlerini çözmesine yardımcı olmak ve içinde yaşadıkları topluma uyumlu hale gelmelerini sağlamak Sosyal Bilgiler dersinin temel amaçları arasında yer almaktadır. Bununla birlikte bu amaç

doğrultusunda öğrencilere kazandırılmak istenen bilgi, beceri ve değerler, yaşanan teknolojik ve toplumsal değişimlerden de etkilenmektedir.

Individuals who study Social Studies strive to address encountered problems through rational solutions as active citizens. Social Studies is regarded as a crucial discipline for fostering engaged and well-rounded individuals who promote awareness of active citizenship among others, while also developing competencies in areas such as environmental stewardship, understanding human-environment-space relationships, and appreciating both national and universal values. Furthermore, the subject contributes significantly to cultivating individuals who are cognizant of their rights, duties, and responsibilities.

To properly evaluate the concept of sustainability - which holds significant importance in our lives - we must first comprehend its fundamental meaning. The Oxford English Dictionary (2024) defines sustainability as “the property of being environmentally sustainable; the degree to which a process or enterprise can be maintained while avoiding the long-term depletion of exhaustible resources.” Alternative definitions characterize sustainability as “a generational imperative to manage resource bases in ways that maintain average quality of life potentially shareable by all future generations” (Asheim, 1994). According to the Brundtland Report, the proposed development model for all nations incorporates: long-term, stable economic growth; an economy that maintains balance between development and nature; and sustainable economic development based on practices that avoid environmental depletion (Ministry of Foreign Affairs of Turkey, 2023).

To facilitate better understanding of sustainability, a simplified tripartite model has been developed, integrating environmental protection, economic growth, and social equity dimensions. Sustainability is frequently modeled through these three core pillars (Keiner, 2005). For sustainable living, simultaneous environmental, economic, and social development is considered paramount (Büyüksu, 2021). The concept’s three fundamental components are explicitly identified as: the social dimension, environmental dimension, and economic dimension (Fauzi, Svensson & Rahman, 2010). Özgen (2019) emphasizes the necessity of maintaining equilibrium among these components. While the three elements are interrelated, Harris (2003) underscores the importance of examining each dimension separately.

The economic dimension concerns: optimal utilization of scarce resources, production of goods/services following continuity principles, avoidance of sectoral imbalances harming agricultural/industrial production, sustainable management of domestic and foreign debt levels. The social dimension

focuses on human and societal factors, where a sustainable system requires: adequate provision and equitable distribution of social services (education, healthcare), gender equality, political participation. The environmental dimension relates to ecosystems' adaptive capacity, requiring: prevention of renewable resource exploitation, protection of biodiversity, maintenance of atmospheric balance, preservation of ecosystem elements. Notably, achieving economic and social sustainability proves exceptionally challenging without first ensuring environmental sustainability (Tıraş, 2012). Sustainability ultimately constitutes an integrative framework that reconciles relationships between environment, society, and present generations' responsibilities toward future generations (Ozmehmet, 2008).

The social dimension of sustainable development goals emphasizes the imperative of fulfilling individuals' basic needs. Within this framework, it encompasses: maintaining and promoting social diversity, eliminating gender inequality, and addressing governance and security issues as fundamental components of sustainable development's social sphere (Bilgili, 2017).

Concurrently, the social dimension confronts multifaceted challenges including: rapid population growth, inadequate healthcare services, poverty, low educational attainment, and employment scarcity (Kınacı, Albuz Pehlivan, & Seyhan, 2011).

A substantive analysis reveals that the social dimension of sustainable development fundamentally aims to enhance quality of life by addressing these critical human development parameters. This dimension operationalizes its objectives through three primary mechanisms: Social equity preservation (diversity maintenance and gender parity), institutional capacity building (governance structures and security systems), human capital development (healthcare, education, and employment infrastructure).

Within the framework of sustainable development, the social dimension encompasses improving and enhancing the welfare levels of all future generations. Life standards can be regarded as a broad concept that addresses the well-being of all individuals, along with their social relationships. This dimension also includes regulating environmental conditions, ensuring economic development, and promoting economic mobility, as well as addressing issues such as meeting the needs of impoverished individuals and guaranteeing that future generations have access to the same opportunities as those available to people living today (Nemli, 2004).

When examining the environmental dimension of sustainable development, it entails safeguarding natural resources and biodiversity

for the future of the planet, preparing science-led initiatives to understand the natural environment comprehensively, reducing waste discharge into ecosystems, and promoting recycling (Kınacı, Albuz Pehlivan, & Seyhan, 2011). The environmental dimension focuses on the qualitative and quantitative aspects of the natural environment, which provides the essential conditions for human survival. From the neoclassical perspective and the environmental economics viewpoint, the quality and quantity of the natural environment are conceptualized as “natural capital” (Yeni, 2014).

When examining the economic dimension of sustainable development, it fundamentally involves the preservation of accumulated capital - in other words, utilizing resources without depleting them entirely (Nemli, 2004). The economic aspect of sustainable development emphasizes the need for more conscientious practices in utilizing natural resources for economic activities, given the limited and scarce nature of the Earth’s resources (Yavuz, 2010)

Due to the exhaustible nature of natural resources, striving to distribute them equitably and justly to improve individuals’ living conditions and ensuring their efficient utilization emerge as primary objectives within the economic dimension (Kınacı, Albuz Pehlivan, & Seyhan, 2011).

When examining the economic dimension of sustainable development, it emphasizes the necessity of maintaining or diversifying the various types of capital involved in economic production. These capital types can be categorized as produced, natural, human, and social capital. While the specified forms of capital may be substitutable to a limited degree, they are largely complementary in nearly all respects. In this context, over the long term, it becomes essential to safeguard all the aforementioned types of capital (Harris, 2003).

The concept of sustainable development refers to meeting the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). Among the foremost driving factors of sustainable development is sustainable consumption behavior. Sustainable consumption advocates for addressing fundamental human and societal needs while avoiding waste and excessive consumption (Abdulrazak & Quoquab, 2018).

In 2015, the United Nations adopted the Sustainable Development Goals (SDGs). The UN Development Programme established 17 Sustainable Development Goals with 169 associated targets. The program’s fundamental objective can be characterized as recognizing the need to integrate strategies that: eradicate poverty and other deprivations; combat climate change;

protect our water resources and forests; improve health and education; reduce inequalities; and foster economic growth. The 17 Sustainable Development Goals identified by the UN Development Programme are listed below.

- No Poverty
- Zero Hunger
- Good Health and Well-being
- Quality Education
- Gender Equality
- Clean Water and Sanitation
- Affordable and Clean Energy
- Decent Work and Economic Growth
- Industry, Innovation and Infrastructure
- Reduced Inequalities
- Sustainable Cities and Communities
- Responsible Consumption and Production
- Climate Action
- Life Below Water
- Life on Land
- Peace, Justice and Strong Institutions

Partnerships for the Goals (<https://sdgs.un.org/goals>).

Sustainable development aims to enable all individuals to live with dignity and further develop their personalities. Among its objectives are ensuring that personal development processes maintain the dignity of both current individuals and future generations, while guaranteeing democratic awareness, cultural diversity, and legal safeguards (Mengi & Algan, 2003). Furthermore, sustainable development emphasizes meeting all educational and health needs of individuals, promoting social equality and justice, and fostering participatory democracy (Harris, 2003). When examining Social Studies education, we find that it enables individuals to: Recognize their personal, social, and cultural identities throughout life, internalize democratic values, enhance problem-solving, decision-making, and participatory skills, become more effective in social life (Yaşar, 2008). Social Studies not only facilitates effective participation in societal life but also provides individuals with

knowledge and experience about the cultural characteristics of their social groups, thereby helping to transmit these characteristics to new generations (Çengelci, 2012). Moreover, the Social Studies curriculum intentionally exposes students to various social problems to help them adapt to social life. In this way, Social Studies plays a crucial role in shaping students' social character (Sözer, 2008). In this context, it can be argued that Social Studies is a discipline capable of instilling in individuals the behaviors required by the social dimension of sustainable development.

Environmental conservation is a crucial aspect of sustainable development. It recognizes that ecosystems have limited self-renewal capacities and that irresponsible human activities lead to the degradation of air, water, soil, and biodiversity. Furthermore, the combination of uncontrolled population growth, environmental pollution, and excessive natural resource consumption has pushed the planet beyond its carrying capacity. This strain has resulted in critical issues such as disrupted greenhouse gas emissions, deforestation, and ozone layer depletion, all of which threaten global ecological stability (Bansal, 2002). Social Studies education plays a vital role in fostering environmental awareness (Karatekin, 2011) and equipping individuals with ecological consciousness (Yalçınkaya, 2012). Environmental education within this discipline aims to help individuals: Acquire the knowledge, skills, and behaviors needed to live in harmony with nature, develop awareness about natural resource use, from waste production to water and energy consumption, take responsibility for environmental protection, contribute to solving ecological problems (Demirkaya, 2006). The perspectives of Social Studies and sustainable development converge on natural environmental issues. Consequently, Social Studies education is poised to play a significant role in achieving sustainable development goals particularly in protecting natural environments and ensuring future generations inherit equivalent ecological conditions.

An examination of sustainable development goals reveals their strong emphasis on the finite nature of natural resources (Bilgili, 2017). In this context, sustainable development primarily aims to ensure that economic activities effectively address both individual and societal needs. It highlights the importance of creating economic conditions that support individual efforts while considering the benefits for both current and future generations (Mengi & Algan, 2003). Developing students' economic perspective constitutes one of the fundamental objectives of Social Studies education (Türe, 2018). Specifically, the discipline seeks to equip individuals with: Understanding of savings concepts and practical financial decision-making skills, ability to make informed economic choices and take responsibility for those

decisions, knowledge about careers and working life dynamics, capacity to analyze factors influencing economic policies, skills to evaluate production, consumption, and unemployment-related policies from multiple perspectives (Akhan, 2015; Aktın, 2016). Through this approach, Social Studies education cultivates: conscious consumers, entrepreneurial individuals, productive members of society. The curriculum thus enables students to: Interpret economic crises from various viewpoints, critically assess diverse economic policies, develop solutions for economic challenges. In this framework, Social Studies emerges as a crucial discipline for instilling not only the social and environmental dimensions but also the economic aspects of sustainable development goals.

Methodology

This study employs a qualitative research design to examine how the Social Studies curriculum aligns with and promotes the Sustainable Development Goals. The research specifically focuses on assessing the curriculum's potential to cultivate sustainability awareness among students through document analysis of official program materials. The investigation adopts an inductive analytical framework to systematically evaluate all components of the 2018 Social Studies curriculum. This approach allows for comprehensive examination of how sustainability principles are integrated throughout the curriculum structure.

The data collection process used 17 sustainable development goals related to sustainable development. It is aimed to increase the reliability of the service by applying expert opinion to determine the overlaps between the content and program of the social studies course and sustainable development systems. The data of this information was analyzed with qualitative content analysis. The content and curriculum of the social studies course differ according to the social, geographical and economic dimensions of sustainable development plans. It was interpreted by supporting with direct quotes and examples in the findings section.

Findings

When the learning areas included in the 2018 social studies curriculum are examined, it is seen that the aim is for individuals to gain an individual or social perspective on the future based on the causes and consequences of human interaction with the environment; to understand the effects of scientific and technological developments on social life and also the damages that some technological developments cause to the environment;

to act more consciously as consumers; to ensure that natural resources are protected for the future of the country's economy; to examine economic conditions and make efforts to develop those that need to be developed from these conditions; to learn concepts related to production, distribution and consumption; to follow the world agenda and to produce solutions to the problems they encounter throughout their lives. Thanks to these learning areas, individuals will be provided with a content that will help them gain sustainable development awareness and also help them incorporate this awareness into their social lives.

When the objectives section of the 2018 social studies curriculum is examined, it has been determined that it is in line with the sustainable development goals of "Health and Quality Life, Quality Education" for individuals who have completed their preschool education in the mental, physical and emotional areas that they need to acquire along with their development processes. It has been seen that the aim is to ensure that individuals who have completed primary school as the next level of education have acquired verbal, numerical and scientific reasoning skills, social skills and aesthetic sensitivity that they will need in their daily lives, and to become healthy life-oriented individuals by using these skills effectively in daily life, and in this context, it has been determined that the goals of "Health and Quality Life, Quality Education" from the sustainable development goals are emphasized. The aim is to raise individuals who have adopted national and moral values, know their rights and responsibilities, fulfill their responsibilities by using their rights and have acquired basic level skills and competencies from those who have completed secondary school, which is the next level of education, and in this context, it has been determined that emphasis is placed on the sustainable development goals of "Health and Quality Life, Quality Education, Reducing Inequalities, Peace, Justice and Strong Institutions, Partnerships for Goals". It is aimed for individuals who have completed high school, which is considered the last stage of compulsory education, to have adopted national and moral values and made them a lifestyle, and to contribute to the country in every sense as productive and active citizens; It is aimed to ensure that they are ready for a profession and life in line with their abilities and desires and it has been determined that the following objectives are emphasized in terms of sustainable development goals: "No Poverty, No Hunger, Quality Education, Decent Work and Growth, Industry, Innovation and Infrastructure, Reducing Inequalities, Sustainable Cities and Communities, Responsible Production and Consumption, Peace, Justice and Strong Institutions, Partnerships for Goals". When the learning areas included in the social studies course curriculum are examined, it is aimed

to “ensure that individuals acquire an individual or social perspective on the future based on the causes and consequences of environment and human interaction, understand the effects of science and technological life on social life, the harm that some technological products cause to the environment and individuals, develop more conscious consumer competencies, understand that the natural resources in the economy are not unlimited and that existing natural resources must be protected, evaluate the economic conditions around them and strive to move these conditions in a positive direction, learn and understand the concepts of production, distribution and consumption, follow the current events of the constantly changing and developing world and offer different solutions to the problems they encounter.” (MEB, 2018), content is presented that can help individuals gain awareness of sustainable development, integrate these goals into their lives, and create masses to achieve the goals.

When the aim of ending poverty was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of specific objectives, it included individuals being aware of the limited nature of the natural environment and natural resources and trying to protect natural resources and the environment with sensitivity towards the natural environment and having an understanding of a sustainable natural environment, being sensitive to issues that concern their country and the world, and developing their skills of perceiving space by explaining the interaction between humans and the environment. When the outcomes were examined, it was determined that the outcomes of not wasting natural resources in the 4th grade, comprehending the multi-dimensionality of events in the 5th grade, analyzing the effects of economic activities on social life, participating in activities that support social assistance and solidarity in the 6th grade, analyzing the effects of the unconscious use of natural resources on living life, and producing new idea suggestions for the solution of global problems in the 7th grade were related. When the skills and values in the program were examined, it was seen that environmental literacy, perceiving space, innovative thinking, entrepreneurship, cooperation, financial literacy, noticing stereotypes and prejudices, empathy, political literacy skills were included; It has been determined that the values of sensitivity, savings, responsibility, solidarity, justice, equality and helpfulness are included.

When the goal of ending hunger was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, individuals were made aware that the natural environment and natural resources were not unlimited and that they made efforts to protect natural resources with environmental awareness. When the outcomes were

examined, it was determined that in the 4th grade, it was emphasized to distinguish the natural and human elements of the environment, to know about natural disasters and to make the necessary preparations, in the 5th grade, to question the causes of natural disasters and environmental problems in the environment, to explain the effects of natural disasters on social life, in the 6th grade, to participate in activities supporting social assistance and solidarity, to produce and apply ideas about the effects of scientific and technological developments on future life, and in the 7th grade, to develop ideas for the solution of global problems in production and management. When the skills and values in the program were examined, it was determined that innovative thinking, environmental literacy, the ability to perceive change and continuity were included; and the values of sensitivity, solidarity, responsibility, justice, savings, and helpfulness were included.

When the purpose of health and quality life was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, the aim of individuals to be sensitive to issues that concern the country and the world was emphasized. When the achievements were examined, it was determined that empathy was emphasized in the 4th grade, questioning the causes of natural disasters and environmental problems in the 5th grade, the necessity of solutions to problems to be based on rights, responsibilities and freedoms in the 6th grade, and evaluating the effects of technological developments in production on social and economic life in the 7th grade. When the skills and values in the program were examined, it was determined that observation, innovative thinking, financial literacy, self-control skills were included; values such as sensitivity, responsibility, and giving importance to family unity were included.

When the purpose of quality education is examined within the scope of the 2018 social studies course curriculum, it has been determined that in terms of special purposes, it is emphasized that they are individuals who protect and love their homeland and nation, who are aware of their responsibilities and strive to fulfill them, who know and use their rights, who continue their lives as citizens with national consciousness, who seek ways to access accurate and reliable information, who have critical thinking skills, who are individuals who know the importance and ways of being a virtuous person and who adopt universal values based on national values, who are individuals who are sensitive to issues concerning the world, and who are aware of their own emotional and physical characteristics, desires, interests and abilities. When the outcomes are examined, it has been determined that in the 4th grade, they are expected to recognize their personal interests, desires, needs and abilities, empathize, give examples of national culture

elements, compare traditional children's games with today's games, develop products to design original products by determining needs, in the 5th grade, they are expected to know their rights and benefit from them, determine the similar and different aspects of different cultures and the culture of the place where they live, analyze the cultural elements that play a role in living together, analyze the role of cultural elements in people living together, evaluate the historical development of cultural elements, in the 6th grade, they are able to analyze the effect of social, cultural and historical ties on the formation of social unity and the development of the individual, question prejudices against different gender, socio-economic and cultural groups, explain the relationship between qualified manpower and the development of the economy, be interested in professions and research the personality traits, skills and educational requirements required by these professions, question the effects of popular culture on culture, and in the 7th grade, they are expected to question their own stereotypes against elements in different cultures. When the skills and values included in the program were examined, it was determined that entrepreneurship, critical thinking, research, seeing stereotypes and prejudices, decision-making, innovative thinking, and cooperation skills were included; and values such as responsibility, diligence, equality, sensitivity, and scientificness were included.

When the aim of gender equality was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of specific objectives, more emphasis was placed on knowing that everyone is equal before the law and that the rules of law are binding for all individuals, being especially sensitive to issues that concern their country and the world, and being aware of their emotional and physical characteristics and abilities, interests and desires. When the outcomes were examined, it was determined that the emphasis was on respecting the different characteristics of all individuals in the 4th grade, giving and explaining examples of children's rights in the 5th grade, being able to give examples of situations where these rights are violated, explaining the importance of using these rights, questioning prejudices against different groups in order to live in social harmony in the 6th grade, participating in activities that support social assistance and solidarity, realizing the value given to women in social life, and analyzing the problems that arise in the implementation processes of democracy in the 7th grade. When the skills and values in the program were examined, it was seen that the skills of cooperation, innovative thinking, entrepreneurship, noticing prejudices, noticing stereotypes, and social participation were included; It has been determined that values such as sensitivity, helpfulness, equality, respect and love, justice, and giving importance to family unity are included.

When the purpose of clean water and sanitation was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, it was emphasized that they should be aware of the limitedness of natural resources and the natural environment and have an understanding of environmental sensitivity. When the achievements were examined, it was determined that in the 4th grade, it was emphasized that they should show conscious consumer behavior by knowing their responsibilities, use natural resources economically, in the 6th grade, they should associate economic activities with natural resources, and analyze the living life that will be affected in case of unconscious consumption of resources, and it was also determined that the achievements that would support this purpose were not included in the 5th and 7th grades. When the skills and values in the program were examined, it was determined that the skills of perceiving change and continuity, perceiving space, environmental literacy, location analysis, observation, innovative thinking were included; values such as responsibility, savings and sensitivity were included.

When the Accessible and Clean Energy objective was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of specific objectives, it was emphasized that they were aware of the limitedness of natural resources and the natural environment and that they were environmentally sensitive individuals. When the outcomes were examined, it was determined that in the 4th grade, they were focused on making conscious choices between needs and desires, using natural resources economically, and in the 6th grade, they were focused on analyzing the effects of unconscious use of natural resources on the lives of living beings, and it was also determined that the 5th and 7th grades did not include achievements that would support this objective. When the skills and values included in the program were examined, it was determined that environmental literacy, innovative thinking, cooperation, and research skills were included; values such as savings, equality, solidarity, and sensitivity were included.

When the purpose of decent work and economic growth was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, it was emphasized that the laws are binding for all individuals, that all individuals are equal before the law, that they know with justifications, that the place of the national economy in all economic systems is meaningful, that natural resources and the natural environment are not unlimited and that they acquire the understanding of protecting them, that all professions are necessary for social life and that all professions are respected. When the achievements are examined, it was determined that the individuals create their own budgets in the 4th

grade, use natural resources economically, analyze economic activities in the environment in the 5th grade, develop new ideas in economic terms, put forward new ideas for the future life together with the developments in science and technology in the 6th grade, know that products with legal copyrights and patents must be provided, analyze the effect of unconscious use of natural resources on the lives of all living things, produce innovative project ideas by paying attention to the geographical features of the country they live in, research the necessary features of the professions they are interested in, and make plans for the professions they can choose in the 7th grade. When the skills and values included in the program were examined, it was determined that environmental literacy, research, perception of change and continuity, entrepreneurship, innovative thinking, financial literacy skills were included; values such as savings, justice, responsibility, sensitivity and scientificness were included.

When the objectives of industry, innovation and infrastructure were examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special objectives, they emphasized the importance of national economy in economic development and economy that concerns the world, they understand the importance of work in social life, and they consciously use all technologies related to information and communication. When the outcomes were examined, it was determined that the 4th graders produced new ideas and designed original products, the 5th graders used technology in terms of social relations, the 6th graders conducted scientific research and put forward original ideas on the effects of these developments on future life, supported the development of a qualified workforce for the development of the national economy and explained the relationship between them, examined economic relations with other countries, and the 7th graders examined the continuity in the creation, protection and dissemination of knowledge and its transfer, and analyzed the changes created by technological developments in the economic network. When the skills and values in the program were examined, it was seen that financial literacy, perceiving change and continuity, cooperation, innovative thinking, and entrepreneurship skills were included; It has been determined that values such as diligence, scientificness, responsibility and savings are included.

When the aim of reducing inequalities was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, it was emphasized that all individuals are equal before the law and that the rules of law are binding for all individuals, that they do not remain indifferent to issues concerning the country and the world, that

they become aware of their emotional and physical characteristics, desires, interests and abilities. When the outcomes were examined, it was determined that the emphasis was on empathy in the 4th grade, giving examples of children's rights, fulfilling the duties and responsibilities required by the roles they take in the groups they participate in in the 5th grade, giving examples of benefiting from children's rights and giving examples of cases where children's rights are violated, questioning prejudices against all individuals in the 6th grade, understanding the role of social assistance and social solidarity in the formation of social unity, evaluating the solutions brought to any problem and defending the necessity of addressing these on the basis of rights, freedoms and responsibilities, and questioning stereotypes against different cultures in the 7th grade. When the skills and values included in the program were examined, it was determined that empathy, cooperation, recognizing stereotypes and prejudices, political literacy, financial literacy, problem-solving skills were included; values such as solidarity, equality, sensitivity, love, respect, helpfulness, justice, freedom, helpfulness, and responsibility were included.

When the aim of Sustainable Cities and Communities was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, it was emphasized that the protection of cultural heritage should ensure the formation of national consciousness, that they develop their spatial perception skills by explaining the interaction between the environment and humans, that they realize that natural resources are not unlimited and that they protect natural resources, and that they comprehend change and continuity by questioning historical evidence from different times and places. When the outcomes are examined, it has been determined that in the 4th grade, they will compare the cultural elements in different countries with the cultural elements belonging to our country, show respect to different cultures; in the 5th grade, they will give examples of common heritage elements in different countries, compare the cultural characteristics of different parts of our country and the cultural characteristics of the places they live in and determine the similar and different elements, analyze the situation of cultural elements in the coexistence of individuals; in the 6th grade, they will analyze the effects of cultural, social and historical ties in the formation of social unity, explain the role of ancient trade routes in cultural, economic and political relations between societies, make inferences about the climatic characteristics in various natural environments in the world, in the 7th grade, they will give examples of the understanding of art, aesthetics and culture in the Ottoman Empire, make inferences about the elements that have an effect on settlement from the past to the present, and interpret

the demographic characteristics of Turkey. When the skills and values in the program are examined, it is seen that the skills of perceiving change and continuity, environmental literacy, observation, cooperation, location analysis, innovative thinking, and spatial perception are included; It has been determined that values such as solidarity, equality, justice, aesthetics, savings, responsibility and peace are included.

When the purpose of responsible production and consumption was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, it was emphasized that they should know that natural resources are not unlimited and try to protect natural resources, understand the interaction between the environment and humans and develop their spatial perception skills, understand the place of the national economy with the basic concepts of the economy, believe in the importance of working in social life and the necessity and dignity of every profession, understand the effects of scientific and technological developments on social life, access information, use it and produce information by observing scientific ethics. When the achievements were examined, it was determined that in the 4th grade, they should make conscious choices between their needs and desires, exhibit conscious consumer behaviors by knowing their responsibilities, use natural resources economically, in the 5th grade, they should develop new ideas in production based on cooperation in production, distribution and consumption networks, in the 6th grade, they should analyze the effects of unconscious consumption of natural resources on the lives of all living things, relate natural resources to economic activities, explain the interaction between qualified manpower and the development of the economy, and in the 7th grade, they should understand the importance of soil from past to present in every aspect. When the skills and values included in the program were examined, it was determined that the skills of perceiving change and continuity, environmental literacy, entrepreneurship, financial literacy, political literacy, innovative thinking were included; values such as solidarity, sensitivity, savings, responsibility, equality, diligence, and scientificness were included.

When the aim of Climate Action was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of specific purposes, it was emphasized that they would develop their spatial perception skills by explaining the interaction between the environment and humans. When the outcomes were examined, it was determined that they would make the necessary preparations against possible disasters in the 4th grade, explain the effects of climates on people's daily lives in the 5th grade, question the reasons for disasters and explain the effects of these disasters

on social life, make inferences about climates in the world in the 6th grade, and propose various ideas for solutions to social and global problems in the 7th grade. When the skills and values in the program were examined, it was determined that the skills of perceiving change and continuity, environmental literacy, spatial perception, and problem-solving were included; and values such as sensitivity, responsibility, and solidarity were included.

When the purpose of Life in Water was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, it was emphasized that they should realize that natural resources are not unlimited and protect natural resources, explain the interaction between the environment and humans, and use communication technologies consciously by considering their effects on social life. When the achievements were examined, it was determined that the focus was on making the necessary preparations for disasters in the 4th grade, using natural resources economically, questioning the reasons for the occurrence of natural disasters and environmental problems in the 5th grade, analyzing the effects of developments in science and technology on future life in the 6th grade and producing new ideas, and analyzing the negative effects of unconscious consumption of natural resources on living life in the 7th grade. When the skills and values in the program were examined, it was determined that research, environmental literacy, observation, perception of change and continuity, cooperation, innovative thinking and perception of space were included; values such as savings, diligence, sensitivity, solidarity, responsibility and scientificness were included.

When the purpose of Terrestrial Life was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, it was emphasized that they would recognize the geographical features of the world and comprehend the interaction between the environment and humans, realize that natural resources are not unlimited and try to protect natural resources with sensitivity and sense of responsibility. When the achievements were examined, it was determined that they emphasized using natural resources economically in the 4th grade, questioning the reasons for the occurrence of natural disasters and environmental problems in the 5th grade, evaluating human lives while making inferences about the climate characteristics seen in the world in the 6th grade, analyzing the effects of conscious consumption of resources on the lives of living beings, and proposing ideas for solving global problems in the 7th grade. When the skills and values in the program were examined, it was determined that the skills of perceiving change and continuity, environmental literacy, political literacy, observation, innovative thinking, and perceiving

space were included; values such as responsibility, sensitivity, savings, justice, and equality were included.

When the aim of Peace, Justice and Strong Institutions was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, emphasis was placed on the aims of raising individuals who love their homeland and nation, who know and use their rights and responsibilities, who have national consciousness, knowing that all individuals are equal before the law, having critical thinking skills in accessing information, giving importance to participation and producing new ideas for solving social problems, individuals leading their lives according to democratic rules, and knowing the importance of being a virtuous individual by adopting moral values. When the outcomes are examined, it has been determined that in the 4th grade, they are expected to explain the relationship between independence and freedom; in the 5th grade, they are able to relate institutions that work to meet social and individual needs; in the 6th grade, they are able to question prejudices against different groups in order to live in harmony in a social environment; they are able to participate in activities that support cooperation and solidarity in the formation of social unity; they are able to argue that solutions to any problem should be within the framework of responsibility, rights and freedoms; they are able to explain the importance of democracy in social life; they are able to know that their rights and responsibilities are guaranteed by the constitution; and in the 7th grade, they are able to relate the basic characteristics of the state to practices encountered in social life. When the skills and values included in the program are examined, it has been determined that critical thinking, empathy, social participation, cooperation, decision-making, using evidence, problem solving, and political literacy skills are included; and values such as responsibility, patriotism, honesty, peace, justice, helpfulness, independence, integrity, equality, respect, love, and freedom are included.

When the purpose of partnerships for purposes was examined within the scope of the 2018 social studies course curriculum, it was determined that in terms of special purposes, emphasis was placed on the purposes of understanding the effects of the development process of science and technology on social life and using technology consciously, caring about scientific ethics while accessing and producing information, and being able to consciously use communication skills to organize social relations and solve emerging problems. When the outcomes are examined, it has been determined that in the 4th grade, they will develop new ideas in order to design original products by considering the needs, introducing them to different countries in the world, in the 5th grade, they will create new

views for production, distribution and consumption in collaboration, they will understand the role of the place of residence and environment in the economic relations between our country and other countries, in the 6th grade, they will be able to put forward opinions on the effects of developments in science and technology on the future life, they will conduct research using scientific research steps, they will defend the necessity of obtaining patented and copyrighted products legally, in the 7th grade, they will benefit from communication tools while fulfilling their rights and responsibilities, they will explain the roles of media tools in social interaction and change, they will examine the protection, dissemination and transfer of information in the context of change and continuity, they will be able to analyze the changes that the use of digital technology brings about in production, distribution and consumption networks. When the skills and values in the program are examined, it is seen that the following are included; It has been determined that values such as responsibility, honesty, savings, diligence, justice and scientificness are included.

Discussion, Conclusion and Recommendations

In this section, the 2018 social studies course curriculum was analyzed with the document analysis method in terms of sustainable development goals and the results and recommendations obtained were conveyed.

One of the aims of the study is to analyze the social studies course curriculum in terms of sustainable development goals and to reveal the extent to which sustainable development goals are included and to emphasize the importance of the Social Studies course in terms of sustainable development goals. In this context, Hacat and Demir (2019) conducted a study titled “Evaluation of the Social Studies Curriculum in Terms of Sustainable Development Education” and evaluated the specific aims, skills, values and achievements in the 2018 social studies course curriculum in terms of sustainable development goals. As a result of the study, educational statements were determined for the sustainable development goals of all departments in the program. When the specific aims were examined, in line with the research conducted, the protection and conscious use of natural resources, the generation of new ideas for sustainable development problems and educational strategies were included. In this context, when the skills were examined, it was determined that critical thinking, research, decision-making, spatial perception, financial literacy, legal literacy, environmental literacy, political literacy, empathy, self-control, observation, problem solving, cooperation, time and chronology perception, social participation, and innovative thinking skills were included.

When looking at the values, it was determined that the values included sensitivity, equality, savings, responsibility, patriotism, justice, love, respect, peace, solidarity, and helpfulness. It was also determined that there were gains related to sustainable consumption and production, climate change, population and migration, social integration, and clean energy.

As a result of his study, Yalçın (2022) determined that the specific objectives, achievements, skills and values of the 2018 social studies course curriculum were compatible with the UN 2030 sustainable development goals in many ways. He determined that the goal of accessible energy resources, one of the sustainable development goals, was more limitedly compatible with the social studies course curriculum.

In this context, the specific objectives, achievements, skills and values included in the 2018 social studies curriculum, and all of the UN sustainable development goals were examined in terms of quality and structure, and the following conclusions were reached;

When the curriculum is examined in terms of quality and structure with the aim of ending poverty, it is seen that it has similar content to the Sustainable Development Goals. In this context, it has been seen that the subjects such as efficient use of sustainable resources, giving importance to scientific and technological developments, protection of soil, cooperation and solidarity are common. However, due to the commonality of the mentioned subjects, it has been seen that Social Studies course has a great responsibility in achieving the aim of ending poverty.

When the curriculum is examined in terms of quality and structure with the aim of ending hunger, it is seen that it has similar contents to the Sustainable Development Goals. In this context, it is seen that the curriculum includes topics such as sustainable use of resources, emphasis on developments in science and technology, protection and good care of the soil, cooperation and solidarity, and these topics are highlighted.

When the curriculum is examined in terms of quality and structure with the aim of health and quality life, it is seen that it has similar contents to the Sustainable Development Goals. In general, attention is drawn to the sensitivity of students to events that occur on a global scale. In this context, it is seen that the aim of the Social Studies course is to raise individuals who are more sensitive and responsible towards problems at local, national and global levels.

When the curriculum is examined in terms of quality and structure for the purpose of quality education, it is determined that it has similar content to

the Sustainable Development Goals. Here, common topics are culture, career choice, rights and responsibilities, human rights, learning, quality education and learning. It is also noteworthy that an inclusive education policy for all individuals, experiencing cultural diversity, and entrepreneurship are also emphasized. It is also seen that the quality education purpose is more similar to the 4th, 5th and 6th grade outcomes in terms of structure and content than to the 7th grade outcomes.

When the curriculum was examined in terms of quality and structure for the purpose of gender equality, it was determined that it had similar content to the Sustainable Development Goals. When the evaluation was made by taking the grade level into account, it was seen that the achievements in the 7th grade social studies course curriculum, such as unity and solidarity in the social sense, gender equality, and democratic values, were given more space than the other grade levels.

When the curriculum was examined in terms of quality and structure for the purpose of clean water and sanitation, it was determined that it had limited similarity with the Sustainable Development Goals. When evaluated in terms of class level, no qualifications that were deemed appropriate for the 5th and 7th grade achievements could be determined. In this context, the common emphasis was generally seen as sustainability issues.

When the curriculum is examined in terms of quality and structure for the purpose of accessible and clean energy, it is seen that it has similar content to the Sustainable Development Goals. However, it is seen that the 2018 social studies curriculum has limited specific objectives and structurally overlaps with the 4th and 6th grade achievements. However, when the skills and values are examined, it is determined that it is very little related to the Sustainable Development Goals.

When the curriculum was examined in terms of quality and structure with the aim of decent work and economic growth, it was determined that it had similar content to the Sustainable Development Goals. In this context, equality, economic development, natural resources, sustainability and environmental awareness are seen as common emphasized issues.

When the curriculum was examined in terms of quality and structure for the purpose of industry, innovation and infrastructure, it was determined that it had similar content, albeit limited, to the Sustainable Development Goals. In this context, economy and innovation issues were identified as commonly emphasized issues.

When the curriculum was examined in terms of quality and structure with the aim of reducing inequalities, it was determined that it had limited similar content to the Sustainable Development Goals. The common emphasis was on equality and the rights that everyone should have.

When the curriculum is examined in terms of quality and structure for the purpose of sustainable cities and communities, it is seen that it has limited similar content with the Sustainable Development Goals. However, the common emphasized topics are culture, heritage, sustainability, environmental protection, human-environment interaction and natural resources.

When the curriculum is examined in terms of quality and structure with the aim of responsible production and consumption, it is seen that it has similar content to the Sustainable Development Goals. Based on this, it has been determined that the common emphasized topics are production, consumption, sustainability, natural resources, scientific and technological developments, economic growth, nature and environment.

When the curriculum is examined in terms of quality and structure for the purpose of climate action, it is seen that it has limited similar content to the Sustainable Development Goals. In this context, climate and natural environment issues have been identified as common emphasized issues.

When the curriculum is examined in terms of quality and structure with the aim of life in water, it is seen that it has limited similar content with the Sustainable Development Goals. In this context, natural resources, protecting nature, sustainability, scientific development and future life issues were determined as common emphasis topics.

When the curriculum is examined in terms of quality and structure for the purpose of terrestrial life, it is seen that it has similar content to the Sustainable Development Goals. In this context, it has been determined that sustainability, protecting natural resources and innovation are the common topics emphasized.

When the curriculum is examined in terms of quality and structure with the aim of peace, justice and strong institutions, it is seen that it has similar content to the Sustainable Development Goals. In this context, it has been determined that the subjects of peace, justice, society, participation, freedom, laws, sustainability, decision-making and political literacy are the commonly emphasized subjects.

When the curriculum is examined in terms of quality and structure for partnerships for purposes, it is seen that it has similar content to the Sustainable Development Goals. In this context, when evaluated in terms of

class level, common topics suitable for 4th grade achievements could not be determined. Based on this, it was determined that science and technology, innovation, political literacy, access to information and sharing information, and cooperation were the commonly emphasized topics in other class levels.

When the 2018 social studies course curriculum is examined in general, it is concluded that all sustainable development goals are included but not in sufficient amounts. What is important here is that the program does not emphasize sustainable development goals enough. Sustainable development goals are given very little place for all grade levels in the program. This situation also shows that it is insufficient to emphasize sustainable development goals for the Social Studies course, which is very much related to global problems. In light of the results obtained, the following suggestions can be made;

- More space can be given in the curriculum in proportion to sustainable development goals in terms of grade level and learning areas.
- Sustainable development goals offer solutions to events occurring in the world and set appropriate targets. Therefore, sustainable development goals can be given more place in the Social Studies course curriculum, both structurally and content-wise.

Resources

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Extended Abstract

The importance of the subject of social studies is quite great because it includes many issues that concern the world and all these issues are taken into consideration and the human being is taken as the basis. It has shown a continuous increase throughout the world throughout human history. Therefore, natural resources such as soil, air, vegetation, economic resources are also rapidly polluted and depleted. All these natural deteriorations have negative effects on all living things, especially humans. This ability needs to do its part for the knowledge of social studies. First of all, the individuals considered, the individuals who know whether they are naturally delivered and the individuals who show these production exhaustible parts, as well as the individuals who are sensitive to all environmental problems in the world and who work to combat these problems can be considered as the first characteristics of the details of social studies.

Considering that the world is getting older every day and the population is constantly increasing, our world is getting polluted and natural resources are being consumed. In this context, the concept of sustainability, which is a concept as old as the history of science, attracts attention (Pezzey and Toman, 2002). In this sense, the concept of sustainability has been used for many years in the sense of “sustain + able”, “sustainable + doable”; after 1845, it was used in the sense of “defensible”; and until 1965, it was also used in the sense of “sustainable at a certain level” (Online Etymology Dictionary, 2022). Basically, the concept of sustainability means maintaining the capacities of ecological systems stably, increasing the quality of social systems and supporting the increase in quality, and contributing to all kinds of development (Sakalasooriya, 2021).

Continuous and rapid developments in urbanization, industrialization, agriculture being carried out with more and more modern methods, technological and economic developments have damaged the balance between natural resources and needs, and efforts to provide social welfare have begun to threaten the future of humanity. According to Turgut (1996), sustainable development is seen as the generally accepted main concept of environmental protection policies on both national and universal scales today. The concept of sustainable development refers to meeting the needs of this period without compromising and giving up the ability of future generations to meet their own needs (Wced, 1987). The most important driving force of sustainable development can be considered as individuals gaining sustainable consumption habits (Abdulrazak and Quoquab, 2018).

Sustainable development factors are generally divided into three as environmental, economic and social (Kahn, 1995). In this context, sustainability in the economic field addresses the analyses that plan to minimize the costs of meeting the standards aimed at protecting environmental assets (Morelli, 2011). The field of social sustainability can also appear as a strong sense of social harmony and the understanding of equality in accessing basic services. In a different discourse, social sustainability is seen as a condition that improves life within communities and a process that can achieve this condition within communities (McKenzie, 2004). It is noteworthy that environmental sustainability is primarily the measures taken to prevent the depletion or damage of the environment at a time earlier than it should be (Buckingham and Theobald, 2003).

The Sustainable Development Goals were adopted by the UN in 2015. 17 “Sustainable Development Goals” and 169 sub-goals were determined by the UN Development Program. The main goal sought to be achieved in the program can be evaluated as being aware of the fact that it should go hand in hand with strategies that end poverty and other deprivations, combat climate change, protect our water resources and forests, improve health and education, reduce inequality and support economic growth.

Social Studies is an important course to raise individuals who are effective and versatile in clean environment, human-environment-space relations, and national and universal values. Social Studies contributes to raising individuals who know their own rights, duties and responsibilities. It is effective in informing individuals about many issues such as human rights, law, national sovereignty, citizenship and democracy and in forming national identity. In this context, Social Studies has a great responsibility. The fact that sustainable development goals are one of the most mentioned courses in education processes, its relationship with other courses and its great interdisciplinary connections have given this duty to Social Studies. In this respect, it is very important for students taking Social Studies to be conveyed, to be taught and to have their opinions taken within this scope about all sustainable development goals.

The purpose of the research is to examine the Social Studies course curriculum in terms of the objectives included in the Global Goals for Sustainable Development declaration published by the United Nations within the scope of the problems occurring in the world and encompassing all living things, and to reveal the relationship between the specific objectives, gains, skills and values included in the 2018 social studies course curriculum and the sustainable development goals. In this context, it is also aimed to

reveal the responsibilities of the social studies course in order to achieve the sustainable development goals.

In the conduct of the study, document review, one of the qualitative research methods, was used. The 2018 social studies course curriculum was examined in detail, analyzed and interpreted. The study concluded that all sustainable development goals were included in the 2018 social studies curriculum, but very limited attention was paid to clean water and sanitation, accessible and clean energy, industry, innovation and infrastructure, reducing inequalities, sustainable cities and communities, climate action and life in water. In this context, it was suggested that sustainable development goals could be included more in the content of social studies curriculum and that studies could be conducted to create sustainable development awareness in the context of social studies.